2014-06

GTUM-001 (Rev. 1)

User’s Manual

For Auto Ref-keratometer SINGLE LTL

This document is described by G2 Optic Co., Ltd.

Please read this manual carefully before using the device.

G2 Optic Co., Ltd.

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1. IMPORTANT NOTICE

[Classification under the provision of 93/42/EEC(MDD)]
The SINGLE LTL is classified as Class Im device.

[Form of protection against electric shock]
The SINGLE LTL is classified as Class Im.
This product is always protected from electric shock when the power cord is connected between the product and wall outlet.
Class Im is a product in which the protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of the product to the protective (ground) conductor in the fixed wiring of the installation in such a way that accessible metal parts cannot become live in the event of a failure in the basic insulation. Use a power outlet which is equipped with a grounding terminal.

[Degree of protection against electric shock]
The SINGLE LTL is classified as a device with a TYPE B APPLIED PART.

[Degree of protection against ingress of liquids]
The SINGLE LTL is classified as IPX0.

[Degree of protection against flammability]
The SINGLE LTL is classified as a device not suitable to be used in a potentially flammable environment. Never use near flammable materials.

[Method(s) of sterilization or disinfection recommended by the manufacturer]
The forehead rest and chinrest should be wiped using a cloth dampened with soapy water as necessary.

[Mode of operation]
Classification of SINGLE LTL is continuous operation.
Electromagnetic waves discharged from mobile phones, radiotelegraphs, wireless toys can cause malfunction of this product. Please keep away any device that can influence this product.
It is a compulsory obligation to learn the operating manual thoroughly, before installation, use, repair, wash or adjustment of the auxiliary parts of this equipment. For user's safety, please use this equipment only after reading all the instructions included in this manual.
All the information in this manual has been checked out carefully and discerned as accurate one at the time of publication. However, G2 Optic Co., Ltd. takes no responsibilities of the results caused by default, omission, or misuse of it.
G2 Optic Co., Ltd. has rights to modify the product itself or specifications of the product without any prior notice, as well as rights not to renew that modification on this manual.

G2 Optic Co., Ltd.

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2. SAFETY INFORMATION

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment).

Furthermore all configurations shall comply with the system standard EN 60601-1-2:2007. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC 60601-1:2005+A1:2012.

If in doubt, consult the technical service department or your local representative.

For EU Countries

The following mark, the name and address of the EU representative shows compliance of the instrument with Council Directive 93/42/EEC of 14 June 1993 as amended by Directive 2007/47/EC concerning medical instruments.

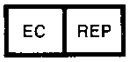
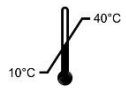
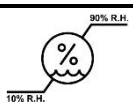
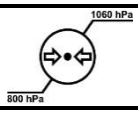
CE
2195

EC REP
Authorized
EC representative

Medical Partner Sp z.o.o
ul. 28 Czerwca 1956r. Nr 213/215
61-485 Poznań, Poland

SYMBOLS FOR SAFETY

No.	Symbol	Description	Reference
1		TYPE B APPLIED PART	IEC 60878-02-02
2		Protective earth (ground)	IEC 60417-5019
3		Alternating current	IEC 60417-5032
4		“On” (power)	IEC 60417-5007
5		“Off” (power)	IEC 60417-5008
6		Do not throw away with general household waste	WEEE Wastes of electrical and electronic equipment
7		General warning sign	ISO 7010-W001
8		Warning: dangerous voltage	IEC 60878
9		Refer to instruction manual	ISO 7010-M002
10		General mandatory action sign	ISO 7010-M001
11		General prohibition sign	ISO 7010-P001
12		Keep away from rain	ISO 7000-0626
13		Use no hand hook	ISO 7000-0622
14		Fragile; handle with care	ISO 7000-0621
15		This way up	ISO 7000-0623

16		Handle with care	IATA regulations
17		Stacking limit by number	ISO 7000-2403
18		Authorized representative in the EC	EN 980-5.13
19		Manufacturer	EN 980-5.12
20		Serial number	ISO 7000-2498
21		Operating instruction	ISO 7000-1641
22		Do not reuse	ISO 7000-1051
23		Sufficient for 1	ISO 7000-0518
24		Temperature limit 10°C min. to 40°C max	ISO 7000-0632
25		Humidity limit 10% to 90% R.H.	ISO 7000-2620
26		Air pressure limit 800hPa to 1060hPa	ISO 7000-2621

3. MAINTENANCE INFORMATION

3.1 USER MAINTENANCE

To maintain the safety and performance of the equipment, never attempt to repair it yourself.
These tasks should be performed by an authorized service representative.
Maintenance tasks that can be performed by the user are as follow;
For details; follow instructions of user's manual

3.2 WARRANTY REGULATION

The manufacturer, G2 Optic Co., Ltd. warrantees the end customer that the product will function properly, have no material or manufacturing flaws for 24 months from the date of purchase under the flowing conditions.

- In the case of valid complaints due to defects or a short delivery, manufacturer will make good its warranty by replacing the product free of charge or repairing it as necessary.

- All other claims of any kind are excluded, especially claims for damages. In case of delayed performance, gross negligence or criminal intent, this shall apply only if there are no compelling legal regulations to the contrary.

- The manufacturer is not liable for defects and their consequences that arise from natural wear, improper cleaning or servicing, the non-observance of instructions for use, servicing or connection, scale formation or corrosion, impurities in the air and water supply, or chemical or electrical influences that are unusual or impermissible according to the manufacturer's specifications.

- The warranty does not generally extend to lamps, glassware, rubber parts and the color fastness of plastic parts.

- No liability is assumed when defects or their consequences can arise from manipulations or changes to the product by the customer or a third party.

- Claims from this warranty can only be asserted when the "Statement of Delivery" has been sent to the manufacturer, and the original can be presented by the operator or user.

4. SAFETY

4.1 SAFETY REGULATION

The instrument SINGLE LTL as a medical instrument complies with the safety regulation EN 60601-1.
Safety is everyone's obligation and responsibility. The safe use of this product is related to everyone such as installer, user, operator and equipment's manager. It must read and learn this user manual is compulsory before installation, using, cleaning, fixing or operation of this product or its accessories. Pay particular attention and be familiar with warning symbols about safety. If do not follow safety direction of this manual, you can get injured or accident when you operate this product. After read carefully and understand this manual, use this product.
This manual is in keep a place where you can find easily.

4.1.1 MEANING OF SYMBOLS

	WARNINGS
	This is provided to alert the user to potential serious consequence (death, injury, or side effect) to the patient or the user.
	CAUTION
	Also it is provided to alert the user to use special care necessary for the safe and effective use of the instrument. They may include actions to be taken to avoid effects on patients or users that may not be potentially life threatening or result in serious injury, but about which the user should be aware. Cautions are also provided to alert the user to adverse effects on this instrument of use or misuse and the care necessary to avoid such effects.
	This explains compulsory obligation before use or operation.
	This explains overall prohibition about installation, operation and maintenance. Carelessness can cause considerable personnel and material loss.
NOTE	This is provided additional information.

4.2 PROPER USE

The user must ensure that that the instrument works properly and is in a satisfactory condition before each use.

The instrument SINGLE LTL is intended only for use in the field of ophthalmology. It is impermissible to use the product for a purpose for which it was not intended.
“PROPER USE” includes following all the instructions for use and ensuring that all inspections and service tasks are performed.
Apply and meet the overarching guidelines and/or national laws, national regulations and the rules of technology for medical instruments applicable for startup and use of the product for the intended purpose.

The user must observe the following:
- Only use properly operating equipment.
- Protect himself/herself and third parties from danger.
- Avoid contamination from the product.

During use, the following national regulations must be observed:
- The applicable health and safety regulations.
- The applicable accident prevention regulations.

To ensure that product maintains their value and are always ready for use, they must be serviced once a year as recommended:
- The safety checks must be performed every year.

Repair and service of the product is authorized only to those who meet the requirements below:
- Technicians of authorized dealers specially trained by the manufacturer, G2 Optic Co., Ltd.
- The trained technicians of manufacturer’s branches.

NOTE	**INFORMATION ON ELECTROMAGNETIC COMPATIBILITY** Based on EN 60601-1-2 concerning the electromagnetic compatibility of electro-medical instruments, we need to point out that: - medical electrical instruments are subject to special measures regarding electromagnetic compatibility and must be operated in accordance with G2 Optic Co., Ltd. Assembly instructions; - portable and mobile high-frequency communications instruments can influence medical electronics.

	CAUTION
	DAMAGE BY USING IMPROPER PARTS If parts from other suppliers, not manufacturer are used, it can influence quality of the product. Use only the parts authorized by manufacturer, G2 Optic Co., Ltd.

	The manufacturer, G2 Optic Co., Ltd. cannot guarantees that parts not delivered by manufacturer will correspond with EMC requirements of EN 60601-1-2.
	DISPOSAL For environment and safety of human, wastes must be recycled or separated. Please contact your local authorized dealer if you have any questions about recycling of the product.

4.3 PRODUCT CHARACTERISTICS

The instrument projects the infrared dots of light onto the retina and the reflection of the dots are captured by a CCD camera.

4.3.1 REFRACTIVE MEASUREMENT (REF)

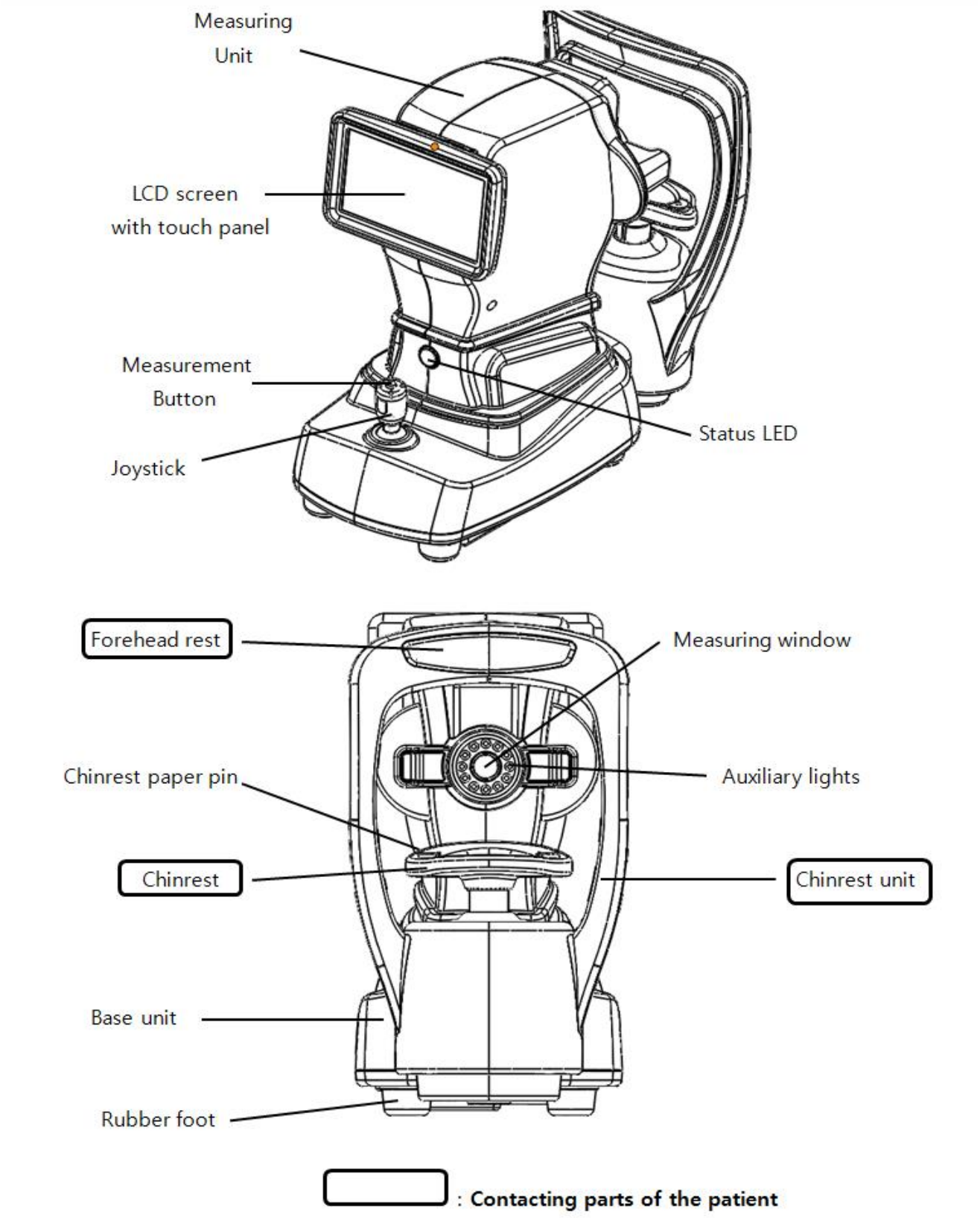
Internal computer analyzes the image and calculates the spherical, cylindrical and axial values.

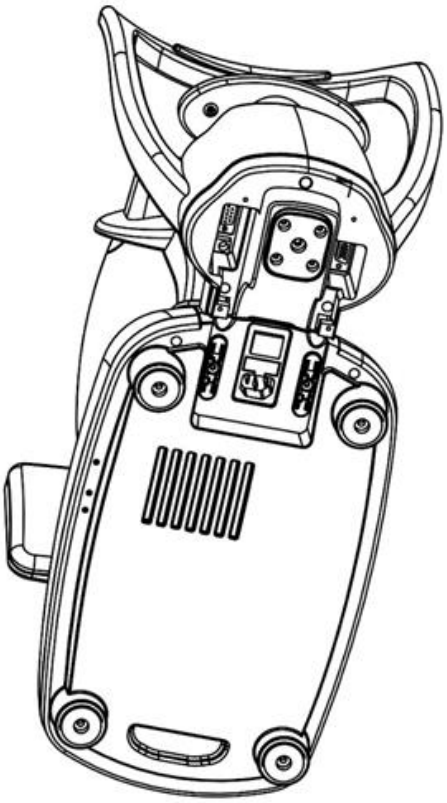
4.3.2 KERATOMETRY MEASUREMENT (KER)

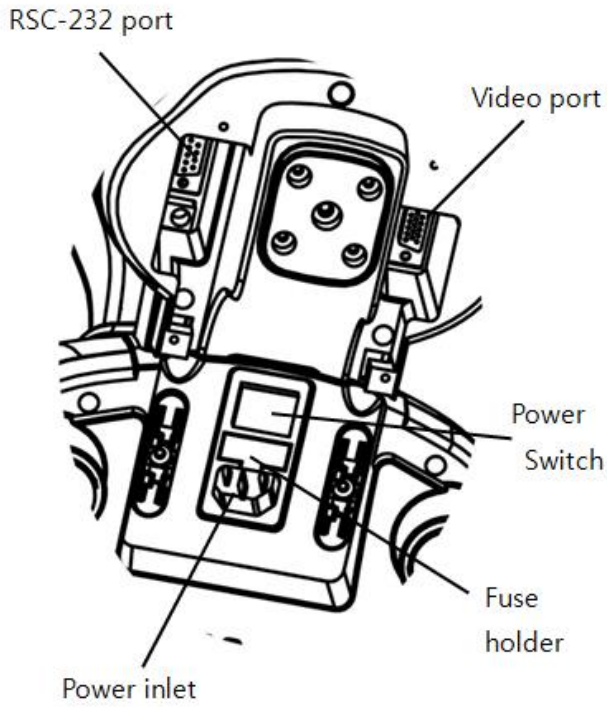
Internal computer analyzes the image and calculates the curvature radius, corneal astigmatic axis and the corneal refractive value.

NOTE	**INTENDED USE** - The instrument SINGLE LTL is designed to measure the refraction, keratometry and peripheral keratometry of children and adults in the field of ophthalmology. - The instrument may only be used by medical professionals.

5. DESCRIPTION OF COMPONENT







Description	Function
LCD Screen	shows all the information as well as measurement results.
Measurement Button	allows to measure the patient's eye.
Status LED	shows status of instrument.
Joystick	allows to move measuring unit.
Chinrest Unit	supports the patient's chin & forehead during measurement.
Chinrest	supports the patient's chin during measurement.
Chinrest paper pin	fixes chinrest papers.
Power switch	allows to turn on the instrument.

Auxiliary lights	helps to show the patient's eye clearly on the screen.
Forehead rest	supports the patient's head during measurement.
Measuring unit	carries out to measure the patient's eye.
Base unit	helps measuring unit to measure and supplies power to measuring unit.
Measuring window	shows accommodation target to the patient.
Rubber foot	fixes body of instrument on the table.
Fuse Holder	keeps safe condition in case of over-current.
Power Inlet	supplies electric-power to body of instrument.
Video out	allows to display on external monitor.
RSC-232Port	allows to communicate with other electric devices.

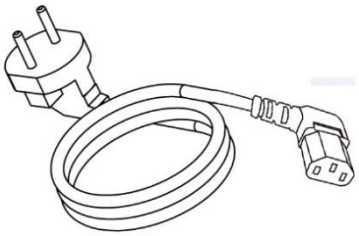
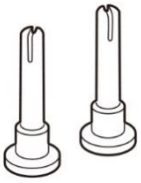
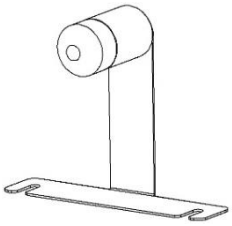
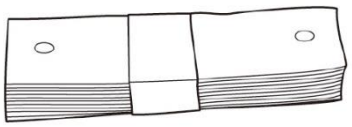
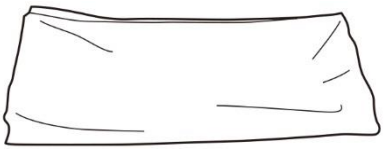
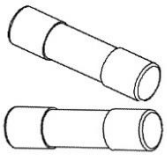
	WARNINGS
	Insert a plastic cover on the unused interface ports such as RSC-232C & Video port external connectors to avoid damage due to water spills or humidity.

6. COMPOSITION OF PARTS WHICH CONTCT THE PATIENT

Forehead rest	Silicon rubber
Chinrest	Silicon rubber
Chinrest unit	Non-flammable grade FV-0 Acrylonitrile Butadiene and Styrene

7. STANDARD ACCESSORIES

The following accessories are standard. Make sure that all these items are included (quantity).

 Power code (1) KKP-4891R	 Chinrest paper pin (2) GT-SLMP-0378	 Model eye (1) GT-SLAC-0103
 Chinrest paper (1) GT-SLAC-0101	 Dust cover (1) GT-SLAC-0102	 User's Manual (1) GTUM-001
 Fuse (2) T2AL250V, 5x20mm		

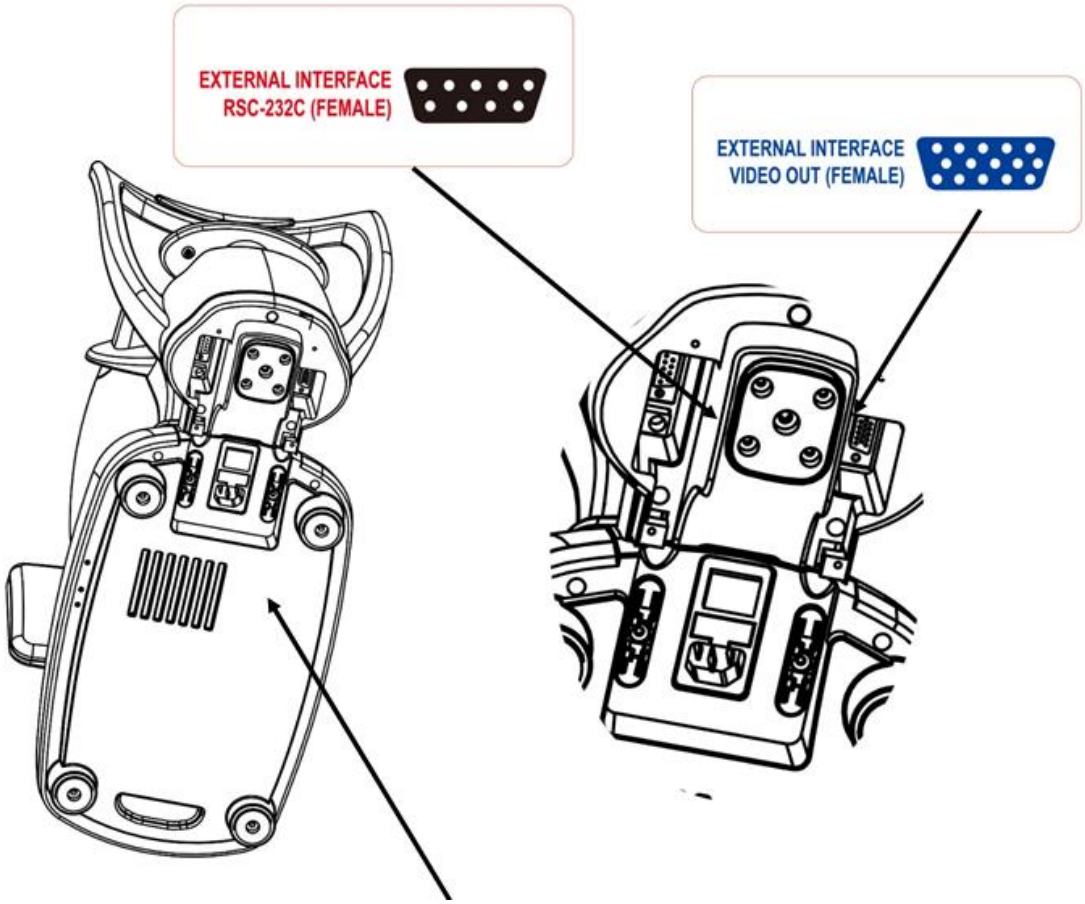
	Using non-genuine parts can cause equipment failure. The manufacturer, G2 Optic Co., Ltd. strongly recommends use of guaranteed parts from the manufacturer.
	The model eye (GT-SLAC-0103) needs to be handled carefully due to potential scratching by tiny particles of dust and alteration from environmental factors.

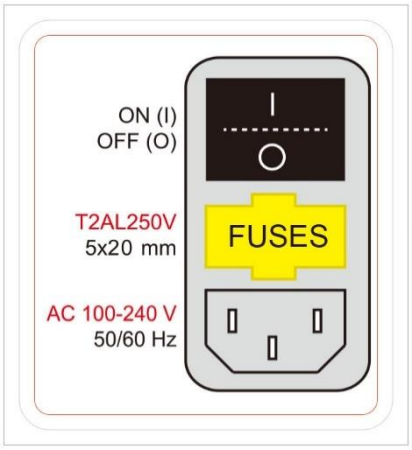
8. LABELING REQUIREMENT

8.1 MARKING PLATE

CE 2195	CE Mark by EC directive 93/42
	Notice about waste disposal after use
	TYPE B APPLIED PART
	Refer to instruction manual
Single LTL	Product name
Auto Ref-Keratometer	Functional name
SN Serial Number	Manufacturer's serial number
AC100-240V 50/60Hz	Power supply
55-85 VA	Power consumption
Weight 13 kg	Weight
MADE IN KOREA	Country of origin
Manufacturer G2 Optic Co., Ltd. B-1512 Woorimlions valley-II 14, Sagimakgol-ro 45beon-gil, Seongnam-si, Gyunggi-do Korea	Manufacturer's company name, address
EC REP Authorized EC representative Medical Partner Sp z.o.o ul. 28 Czerwca 1956r. Nr 213/215 61-485 Poznań, Poland	Specified Authorized EC representative by manufacturer

8.2 INFORMATION LABEL





9. PREPERATION TO OPERATING

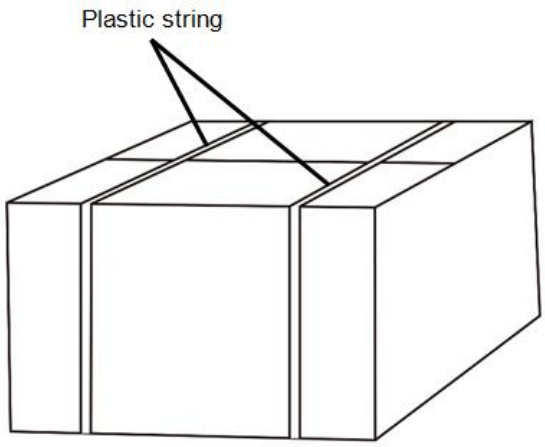
9.1 PREPERATION

9.1.1 INSTALLATION

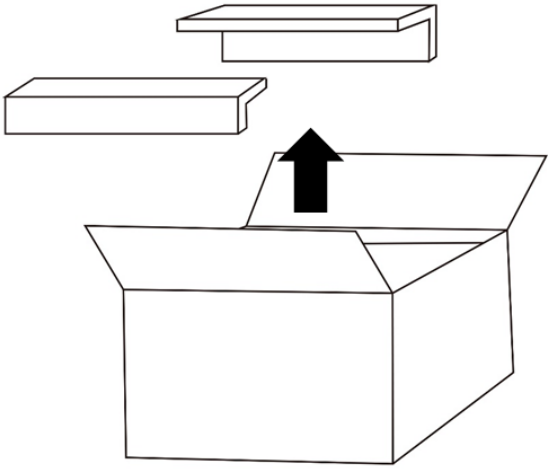
	CAUTION
⚠	To prevent damage and injuries, do not install the instrument on an uneven, unsteady or sloped floor surface.
	When setting the instrument on the table, be careful not to injury the patient's fingers between the instrument and the table.
	When moving the instrument, two people should lift the bottom side of the product.

1) Place the packing box with the instrument on the stable floor.

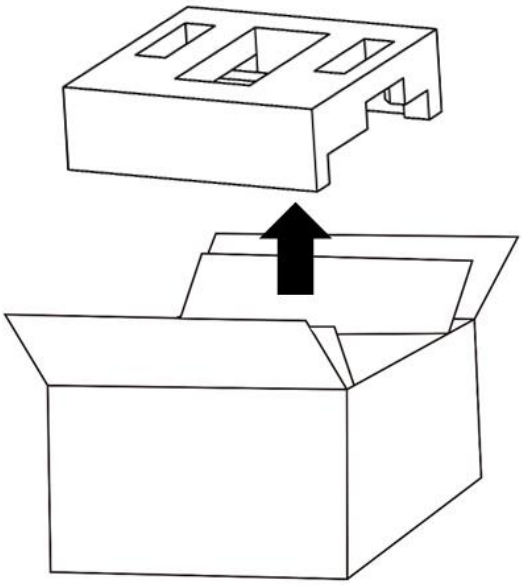
2) Cut plastic strings using safe scissors and remove the adhesive tape.



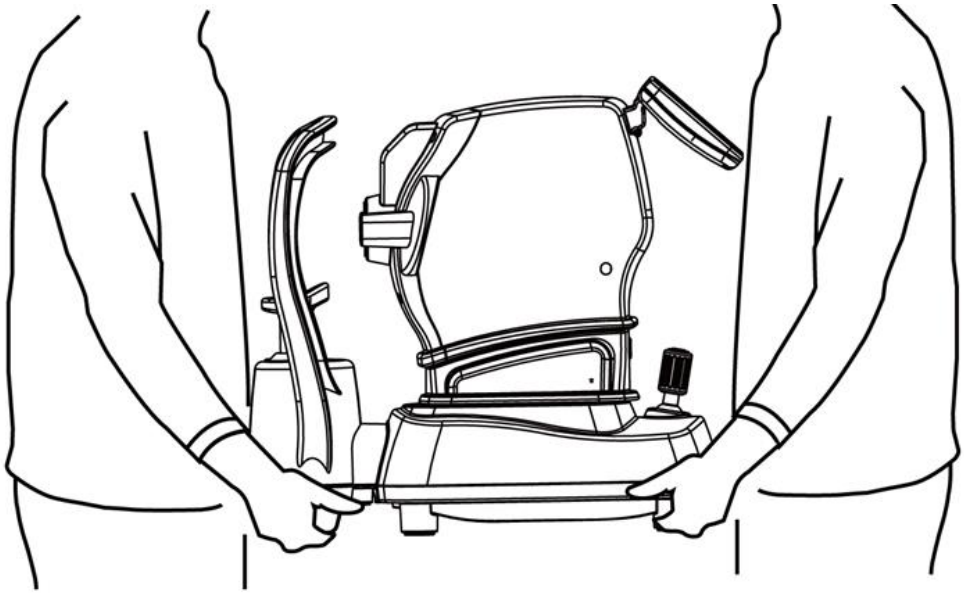
3) Open the box and remove PE forms in the box.



4) Open the inner box and then remove PE forms on the instrument.

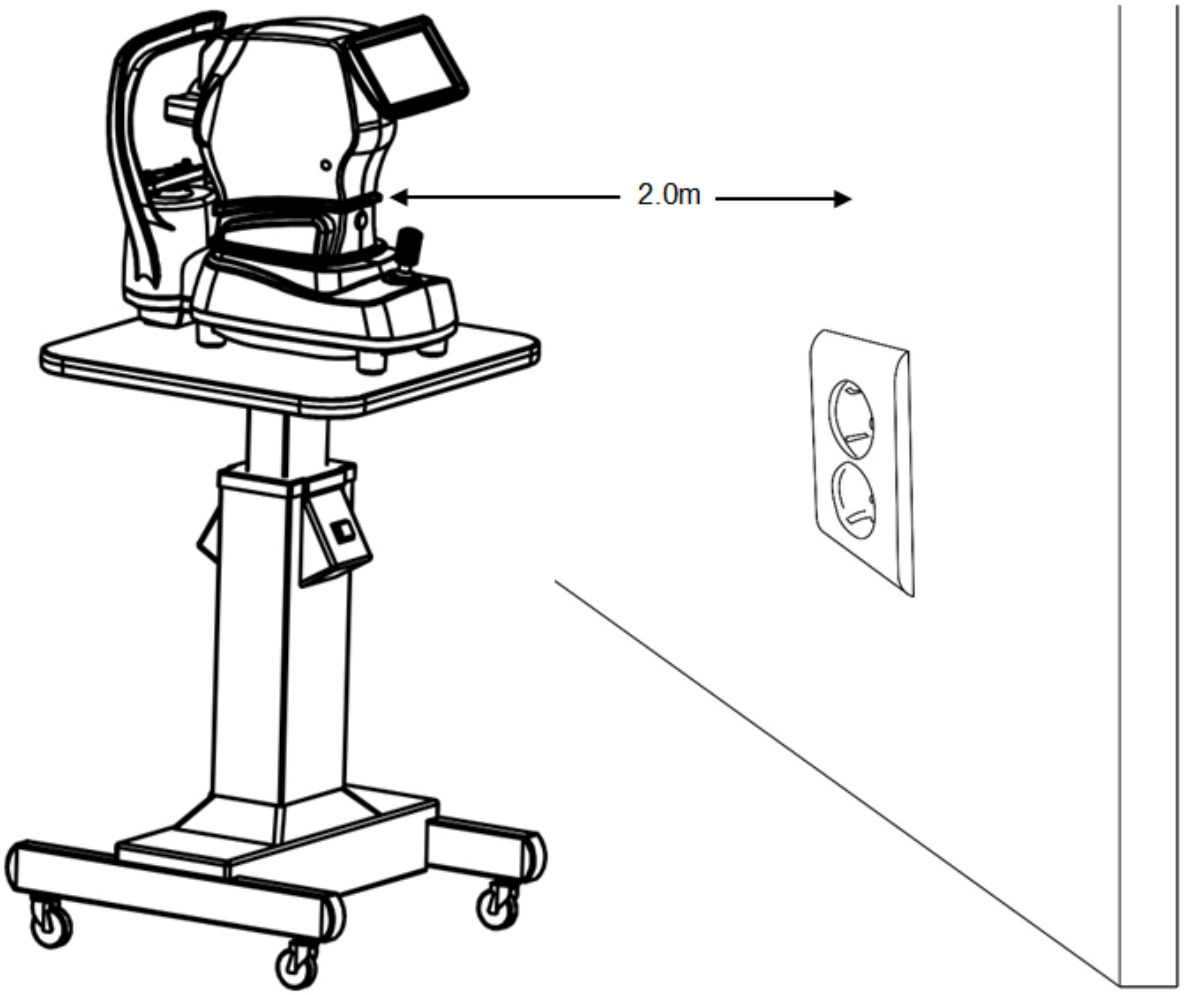


5) Take out the instrument of the box and hold the instrument as follows.



6) Place the instrument on the stable table as follow.

Distance between the instrument and wall outlet should be within 2 m.



9.1.2 CONNECTING THE POWER

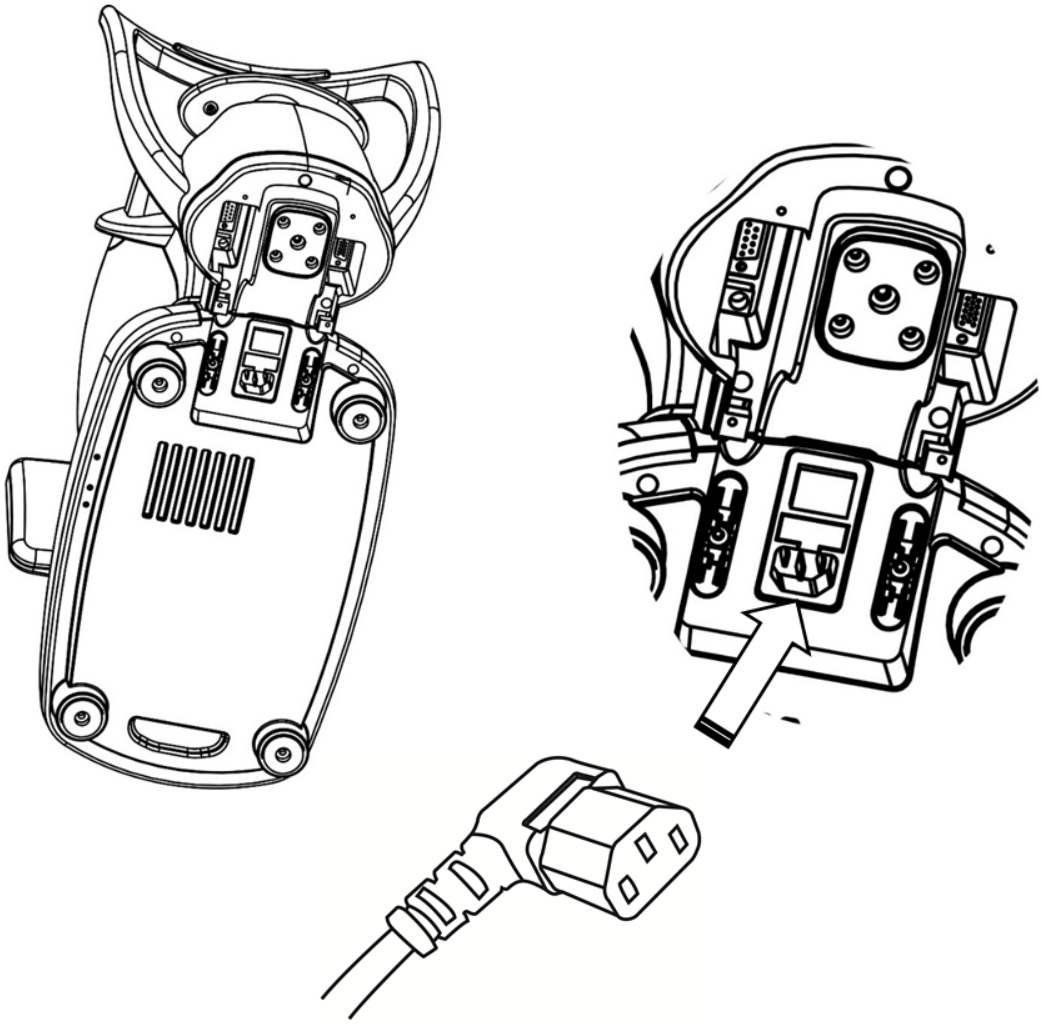
⚠	**WARNING**
	Make sure that the power cord is connected to AC 3-pins socket equipped with grounding.

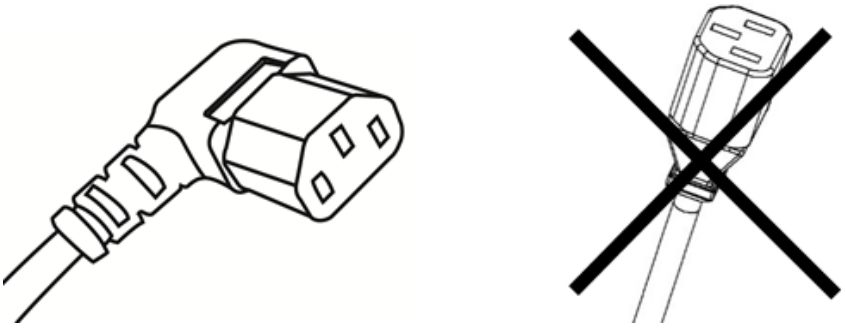
⚠	**CAUTION**
	To avoid electric shocks, do not touch the power cord with wet hands.

1) Make sure that the power switch at the bottom of the instrument is ‘OFF’ (O).

2) Connect the power cord to the power inlet.

3) Insert the power cord into the AC 3-pins socket.



	CAUTION
	Never touch any parts related to electricity with wet hands.
	To avoid electric shock caused by the power cord, please using the bent power cord only as follows. 

	WARNING
	The power cord which is suitable for the policy and law of local country should be used.

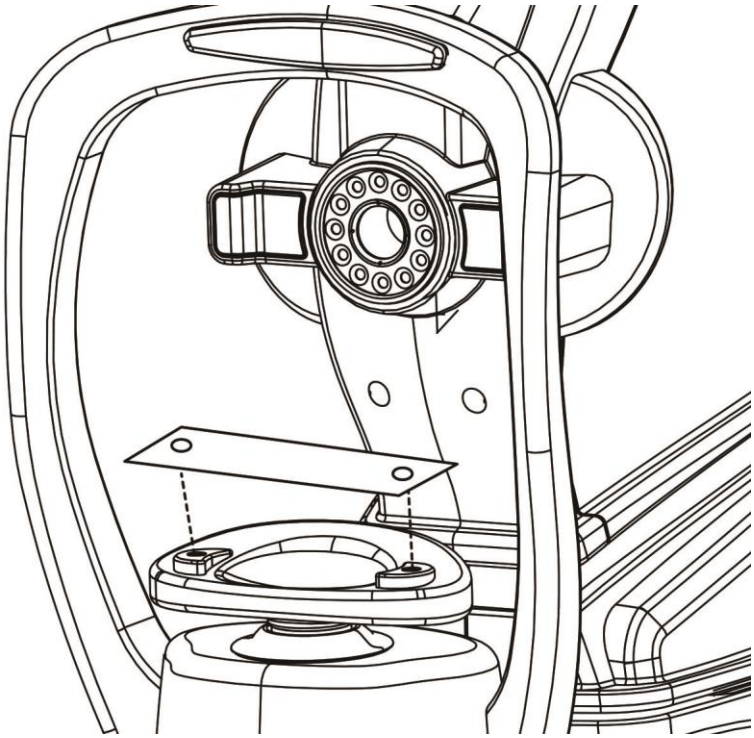
9.1.3 CONNECTION OF EXTERNAL INTERFACE

	CAUTION
	To avoid electric shock, do not touch the external connection terminal and patient at the same time.
	Never touch any parts related to electricity with wet hands.

This instrument can be connected to the external monitor, external thermal printer, personal computer and other external device.

1) Connect the connection cable to the external interface port of the instrument.
2) Connect the other side of the connection cable to the external interface.

9.1.4 SETTING CHINREST PAPER

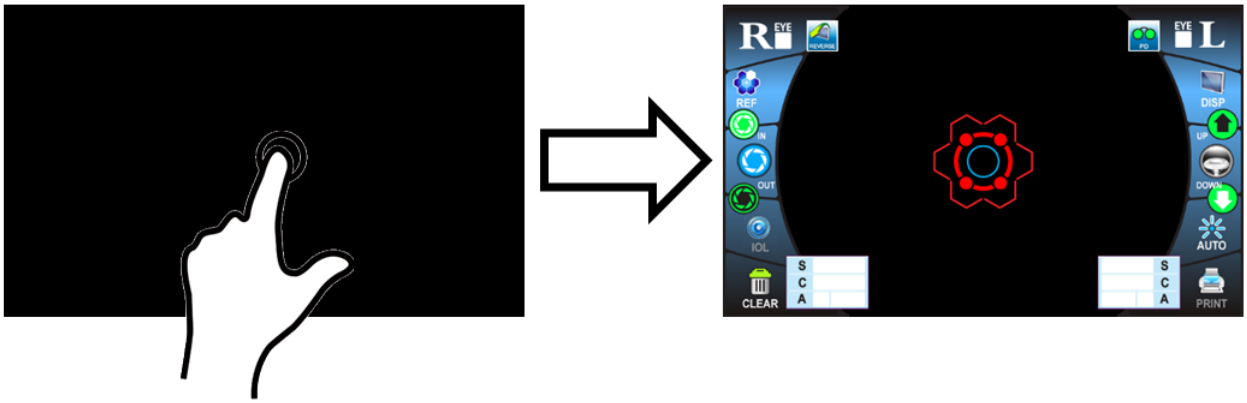


	Never reuse the chinrest paper to prevent cross-contaminants that can cause skin disease.

9.2 RECOVERY FROM POWER SAVE STATUS

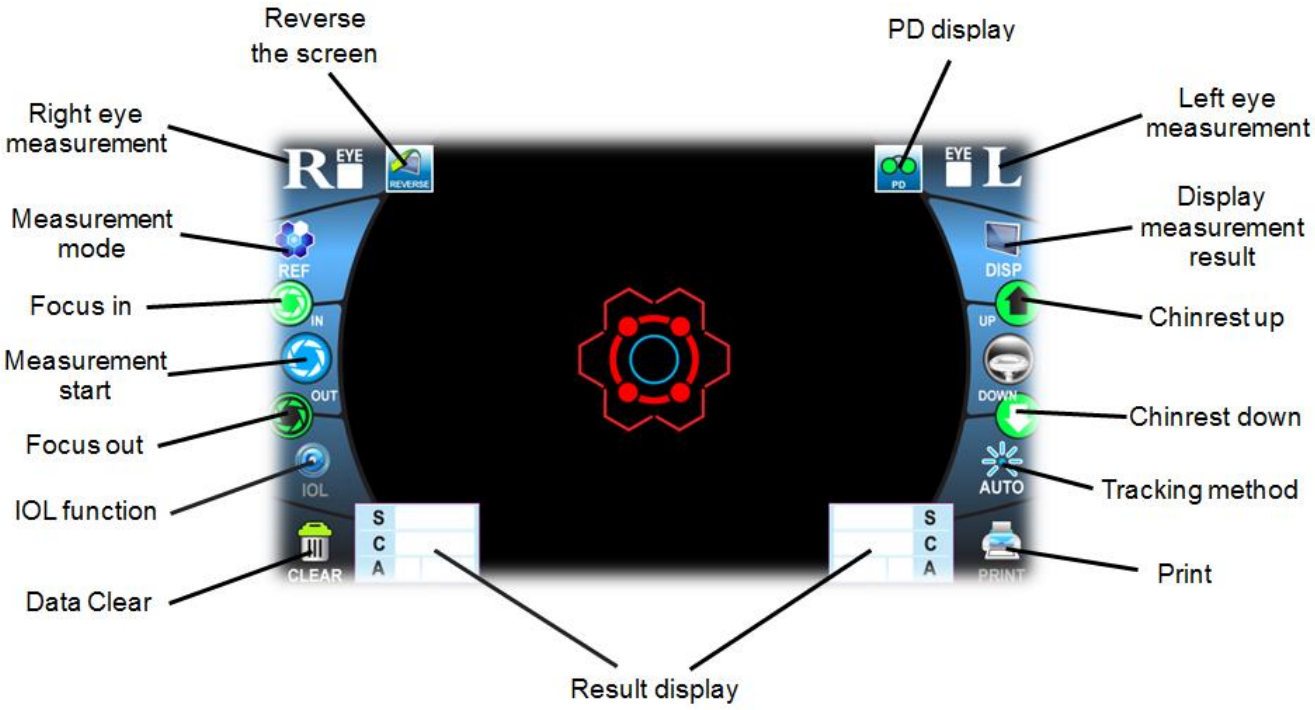
The instrument has power saving function for protecting electrical circuit and saving electricity. When the instrument is not operated during the setting time in MENU, the screen saver will be activated.

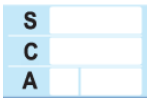
1) Touch the touch panel or operate the joystick.
2) After few seconds, the measurement screen is displayed and measurement can start.



10. OPERATION OF TOUCH PANEL

NOTE	The instrument has a touch panel. Never use any sharp tools such as a pen or needle. Please touch with fingers only.
	Do not touch two points on the touch panel at the same time.



Icon	Function
	Measuring unit is moved horizontal position to right eye.
	Measuring unit is moved horizontal position to left eye.
	Reserve the screen
	-Show general information of the instrument such as VD, STEP and CYL sign. - In case of KER mode, INDEX, STEP and CYL sign are displayed. - When the measurement is completed both eyes, this icon is changed to icon with PD value.
	Display the measurement result.
	If the external printer is connected, the measurement result can be printed.
	Change the measurement mode. : Refractive measurement only : Kertometry measurement only : Simultaneous refractive measurement and Keratometry measurement
	Move the measuring unit in the patient' direction.
	Move the measuring unit in the operator's direction.
	Measurement is started manually. If focusing and alignment is completed, this icon is changed to icon.
	To measure the patient who has implanted IOL due to cataract and presbyopia, touch this icon. When this function is executed, this icon is changed to icon.

	Clear all measurement result data and return to the measurement screen.
	Show the measurement result data
	The chinrest goes up vertically.
	The chinrest goes down vertically.
	Change the tracking method
	: Auto measuring function after auto tracking & focusing
	: Auto tracking & focusing without measurement
	: Manual measuring without auto function

11. GENERAL OPERATION

11.1 PREPARATION BEFORE MEASUREMENT

11.1.1 TURNING ON THE INSTRUMENT

1) Make sure the power cord is connected between the product and the wall outlet.

2) Turn on the power switch.

	If touching the cord or switch with wet hands, it can cause electric shock.
	This instrument requires periodic checking for any damage of the power cord because it can cause fire or electric shock.

3) After startup screen is displayed, the measurement screen is displayed in a few seconds.

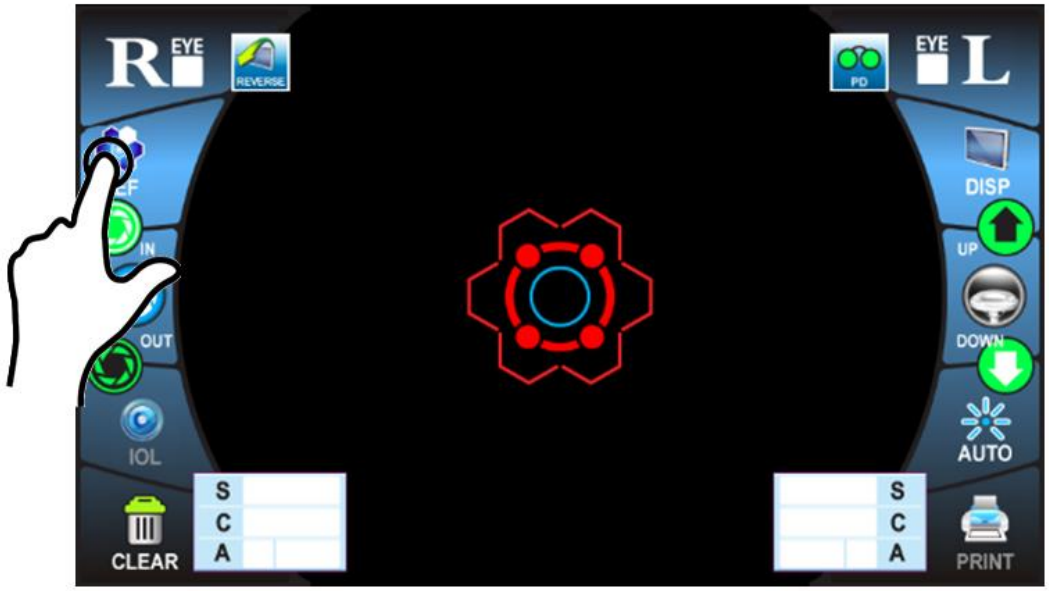
11.1.2 SELECTING THE MEASUREMENT MODE

This instrument has three measurement modes as follows:

REF	: Refractive measurement only
KER	: Kertometry measurement only
RK	: Simultaneous refractive measurement and Keratometry measurement

1) Check that the measurement screen is on.

2) Touch the “Measurement mode” icon on the touch panel and select the one of them and indicate the icon is changed.



	Never touch the touch panel with wet hands to prevent electric shock and malfunction.
	Do not touch two points on the touch panel at the same time.

NOTE	If the patient who has implanted IOL is measured REF or R/K, IOL function should be activated by touching IOL icon before measurement.

11.1.3 POSITIONING THE PATIENT

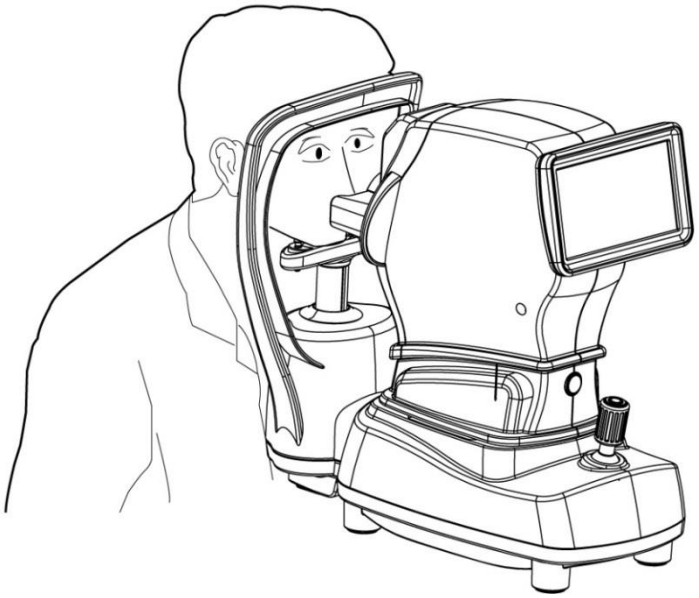
	CAUTION
⚠	Do not insert fingers under the chinrest, it can cause injury.
	When operating “Chinrest Up/Down”, be careful not to catch the patient’ fingers under the chinrest. Give the patient a warning.
	When operating the instrument, be careful that it does not touch the patient’s face. If it touches, wipe the instrument.
	Before the patient’s forehead touches the forehead rest, there are no contaminants on the forehead rest. It can cause skin disease.
	The chinrest paper should be replaced every measurement.

NOTE	Adjust properly the height of the chair and the table that the product is placed on. An uncomfortable position can affect the accuracy of measurement result.

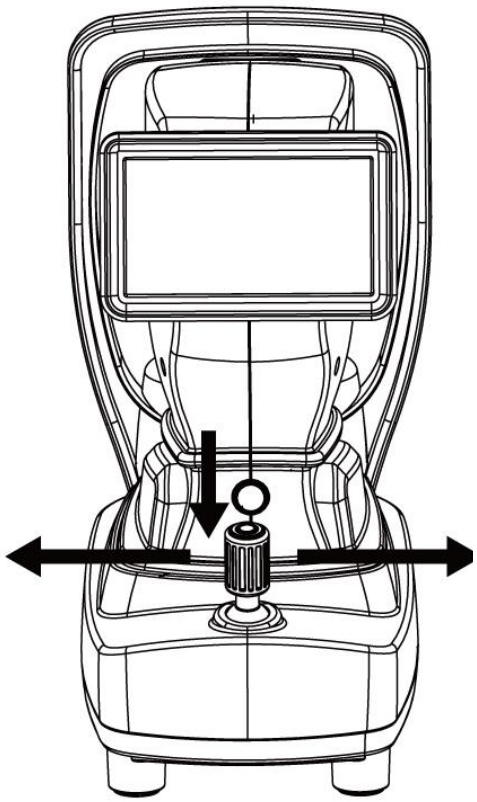
1) Make sure that the patient seat comfortably in a safe chair so that the patient’s chin is positioned on the chinrest safely.

2) Adjust the height of the instrument table for patient to lean his/her chin on the chinrest comfortably.

3) Place the patient’s chin on the chinrest and check that his/her forehead is touching to the forehead rest.



4) Adjust the chinrest height by touching “Chinrest Up/Down” icon or controlling the joystick until the patient’s eyes are positioned on the screen.



Chinrest down

Push joystick to bottom and incline to left

Chinrest up

Push joystick to bottom and incline to right.

11.2 REF MEASUREMENT

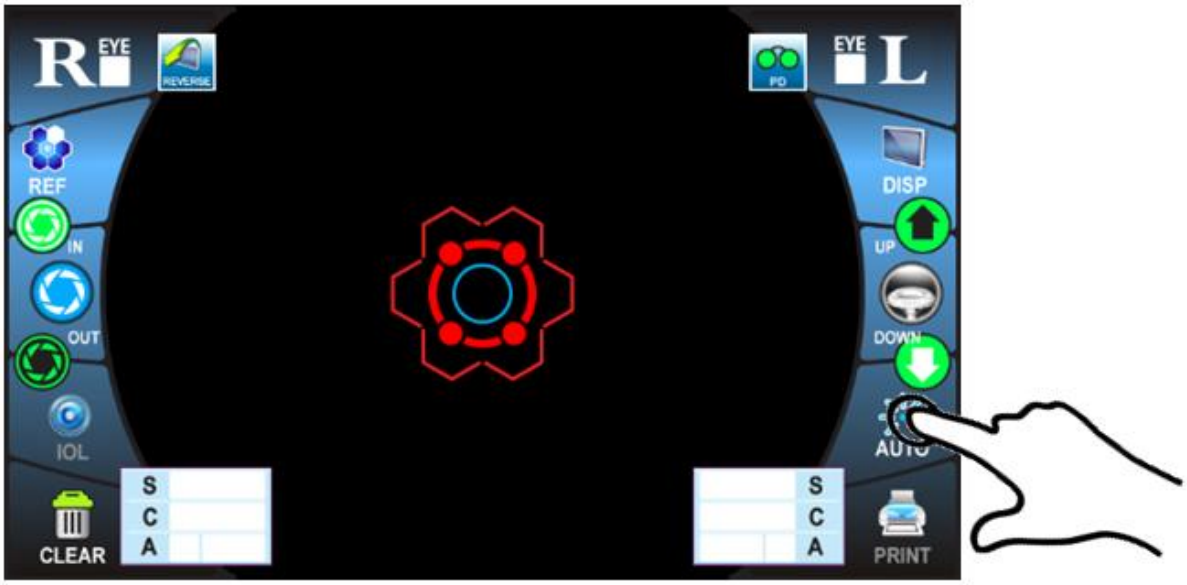
	CAUTION
	When operating the instrument, be careful that it does not touch the patient's face. If it touches, wipe the instrument.

NOTE	If the eyelid and eyelashes cover the pupil, AUTO MEASUREMENT mode may not be possible. In this case, tell the patient to open their eyes as wide as possible or lift the eyelid to allow for measurement.
	Auto measurement mode may not be possible due to frequent blinks or existing abnormalities in the corneal surface caused corneal disease etc.
	If the patient blinks or measurement is taken without proper alignment, the error message will be displayed on the screen.
	If the pupil diameter of patient's eye is less than 2.0mm, this instrument could not measure the refractive power.
	When measuring a patient who has IOL implant, IOL function should be activated by pressing the IOL button before measurement.

11.2.1 AUTO MEASUREMENT

11.2.1 AUTO MEASUREMENT

11.2.1.1 SELECTING THE AUTO ALGINMENT FUNCTION



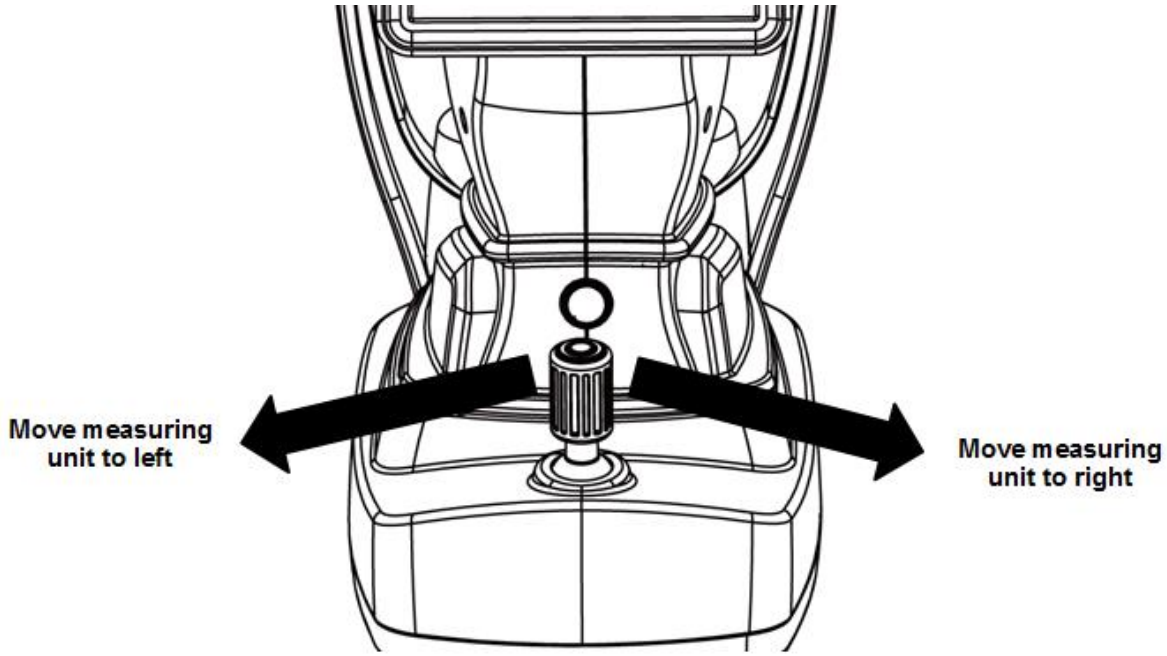
1) Check the measurement screen. If AUTO icon appears on the screen, the auto measurement function is executed.

2) If SEMI or MANU icon is displayed, touches that icon to change to AUTO icon.

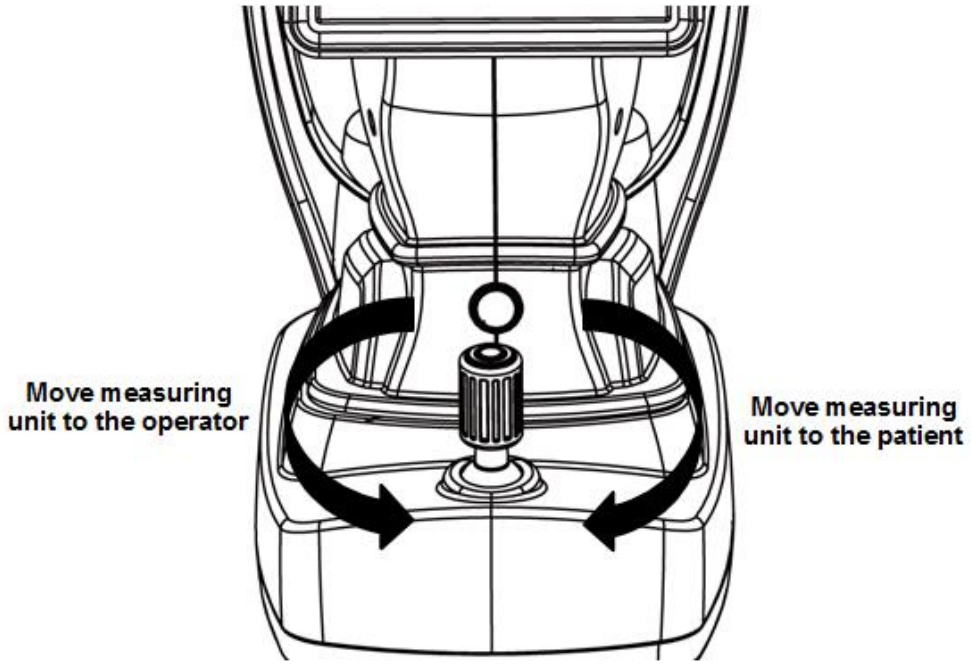
11.2.1.2 ALIGNMENT

11.2.1.2.1 ALIGNING WITH JOYSTICK

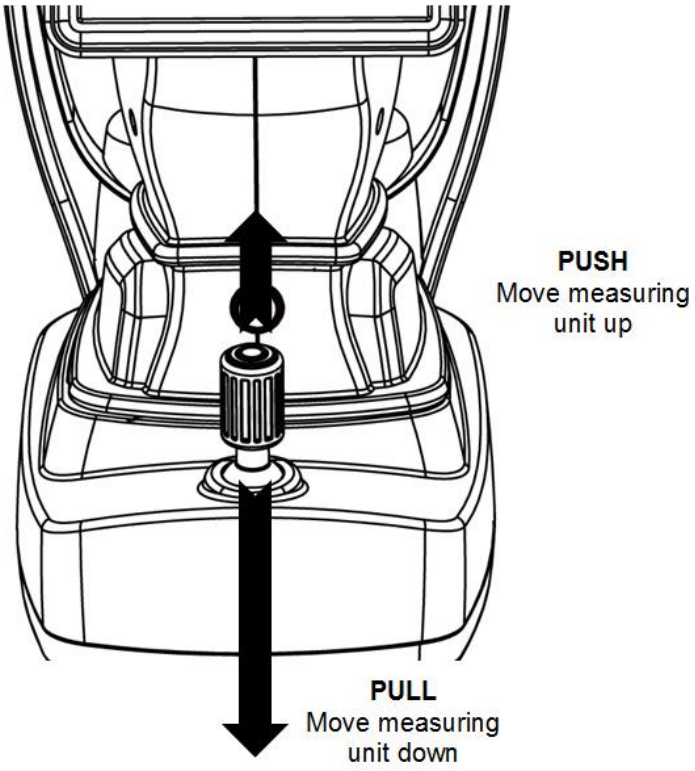
1) The position of measuring unit can be adjusted horizontally by inclining the joystick to left or right.



2) The position of measuring unit can be adjusted laterally by turning the joystick clockwise or counterclockwise.

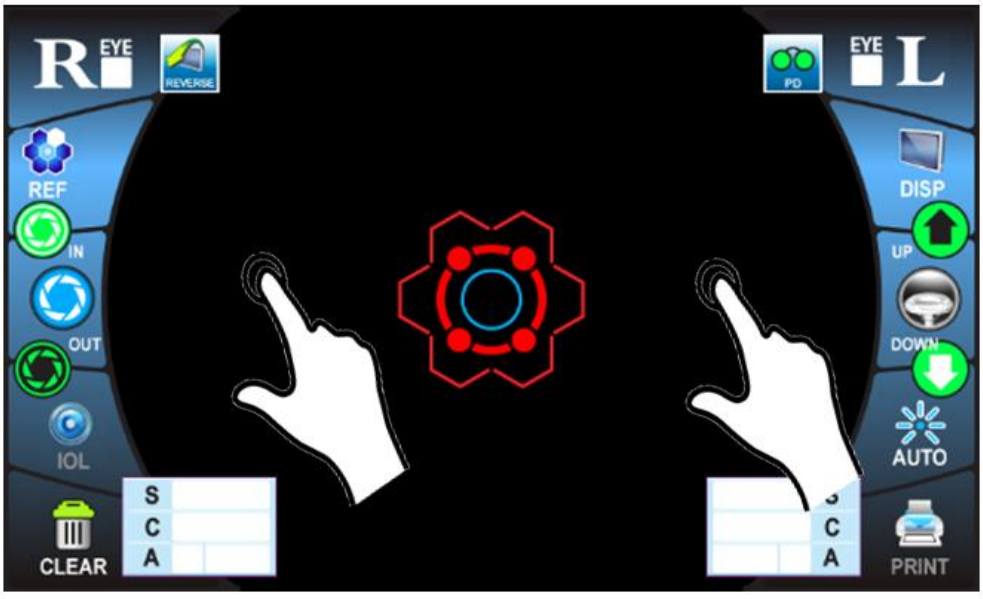


3) The position of measuring unit can be adjusted vertically by inclining the joystick to forward or backward.


PUSH
Move measuring
unit up
PULL
Move measuring
unit down

11.2.1.2.2 ALIGNING WITH TOUCH PANEL

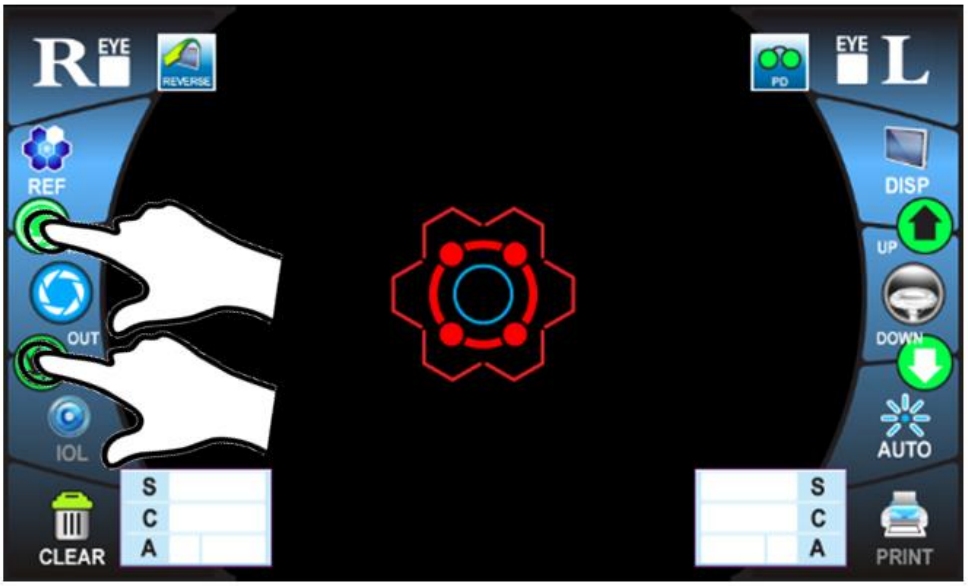
1) The position of measuring unit can be adjusted horizontally by touching left/right side of touch panel.



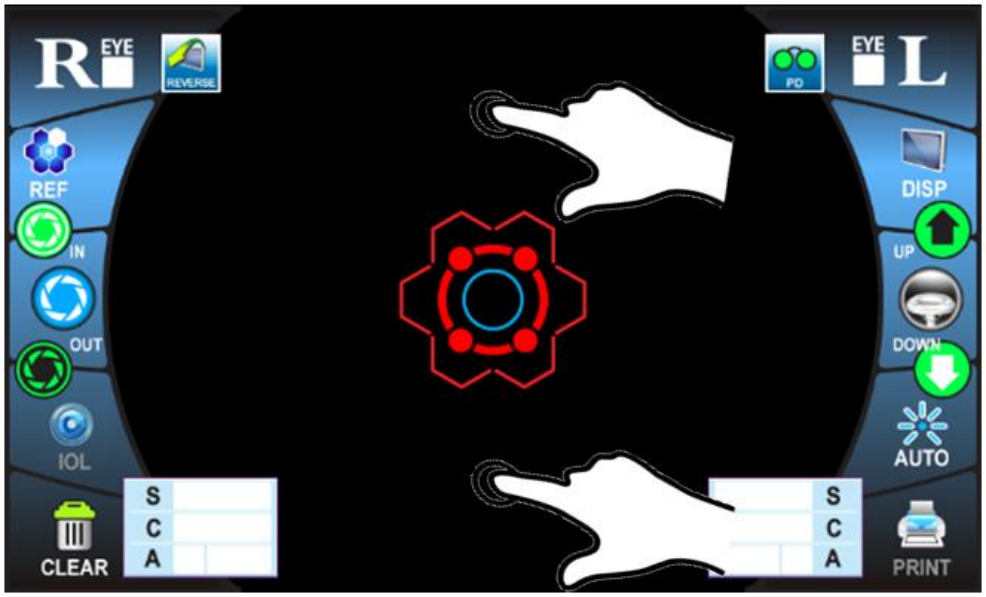
2) The position of measuring unit can be adjusted laterally by touching

and

icon of the touching panel.



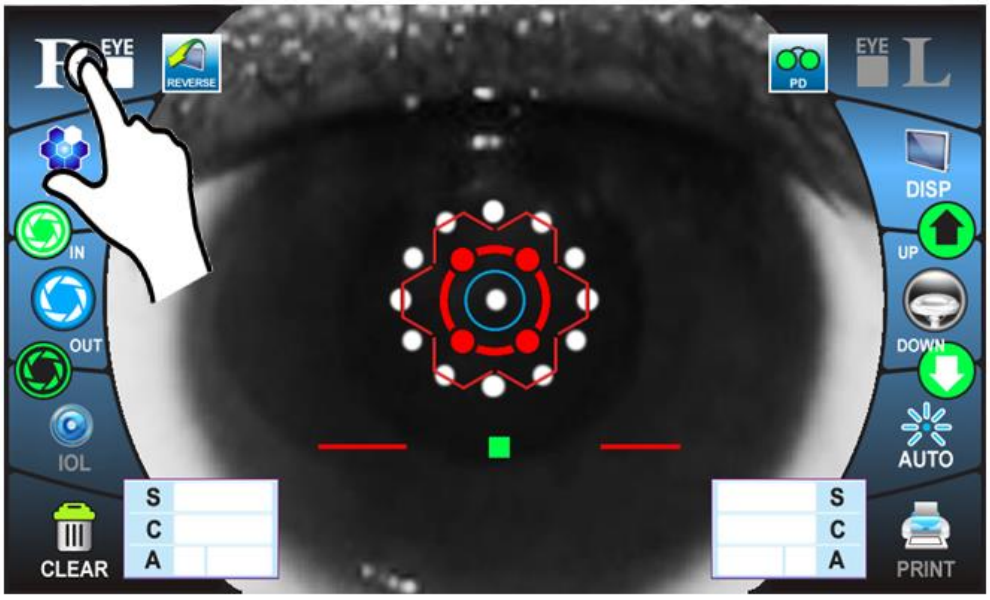
3) The position of measuring unit can be adjusted vertically by touching upper/bottom of touch panel.



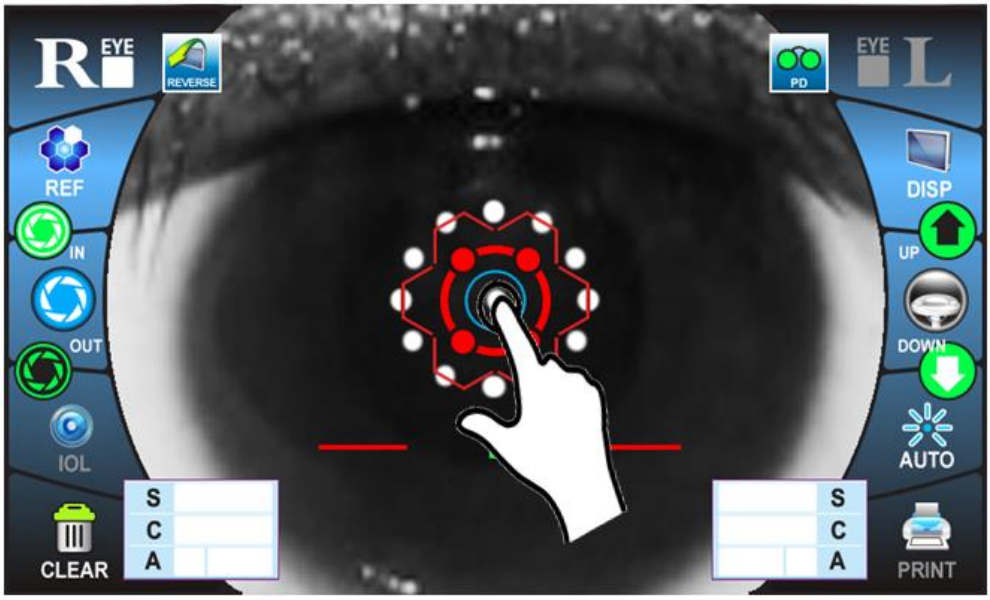
11.2.1.3 MEASUREMENT

1) If

icon is touched, measuring unit is moved to patient's right eye.

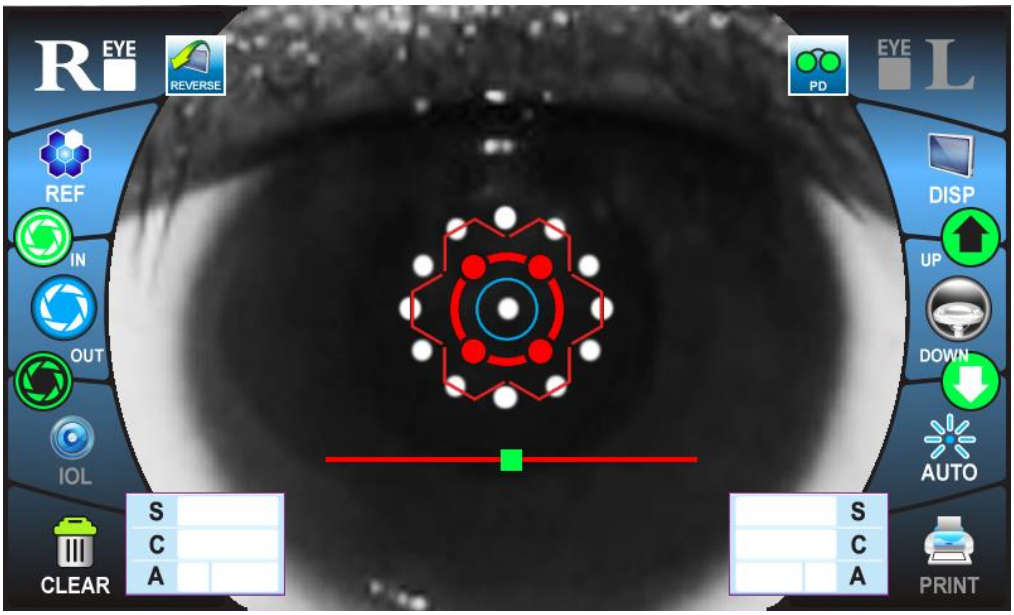


2) If the central red circle is touched, alignment is started automatically.

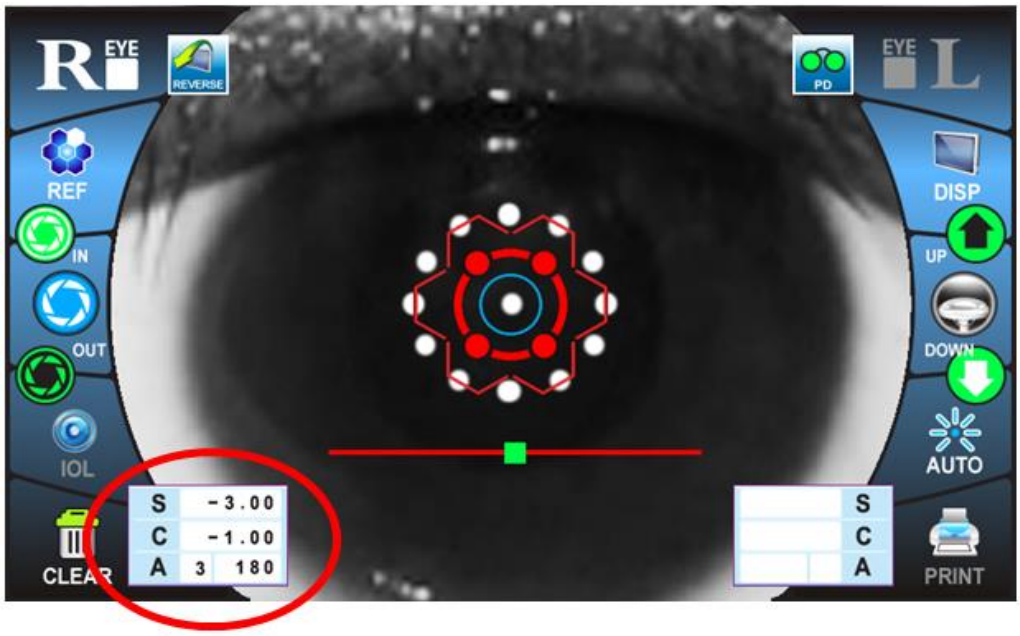


NOTE	If the focus is out of focus or measurement is not carried out even though central red circle is touched, please touch the central red circle again until the measurement is started.
	If the pupil diameter is less than 2.0 mm, the measurement value is not appeared on the screen.

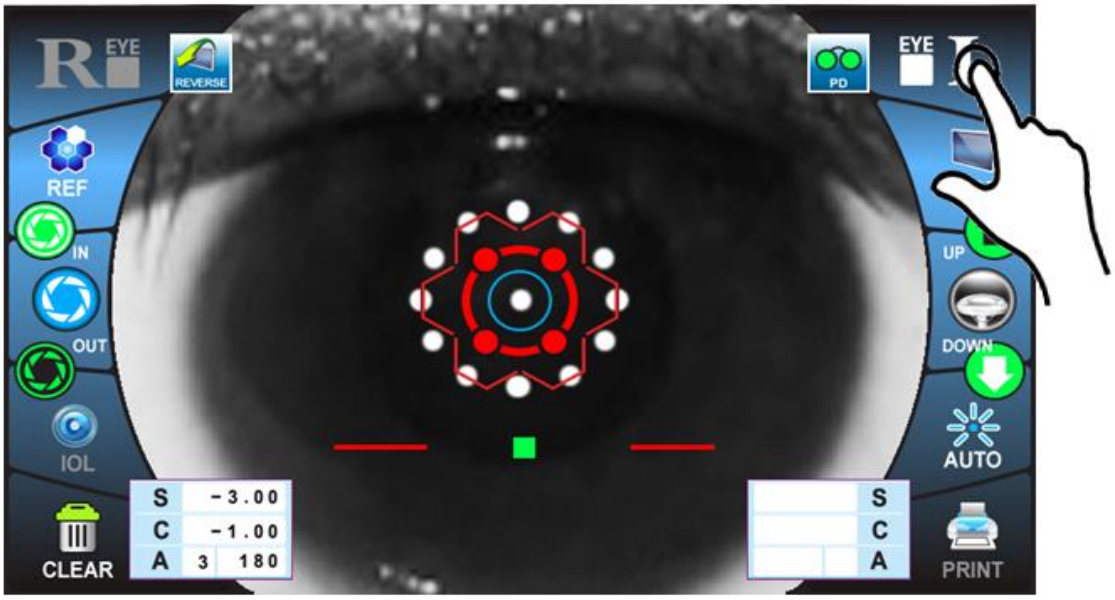
3) In a few seconds, the instrument begins to measure for times which is set on the MANU function.



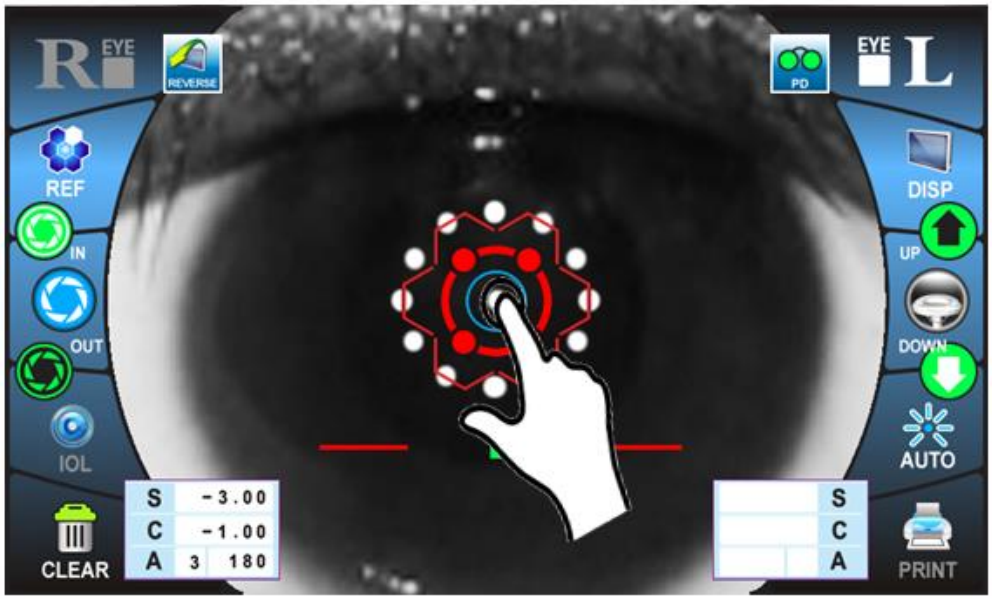
4) When the right eye measurement is complete, the result displays as follows:



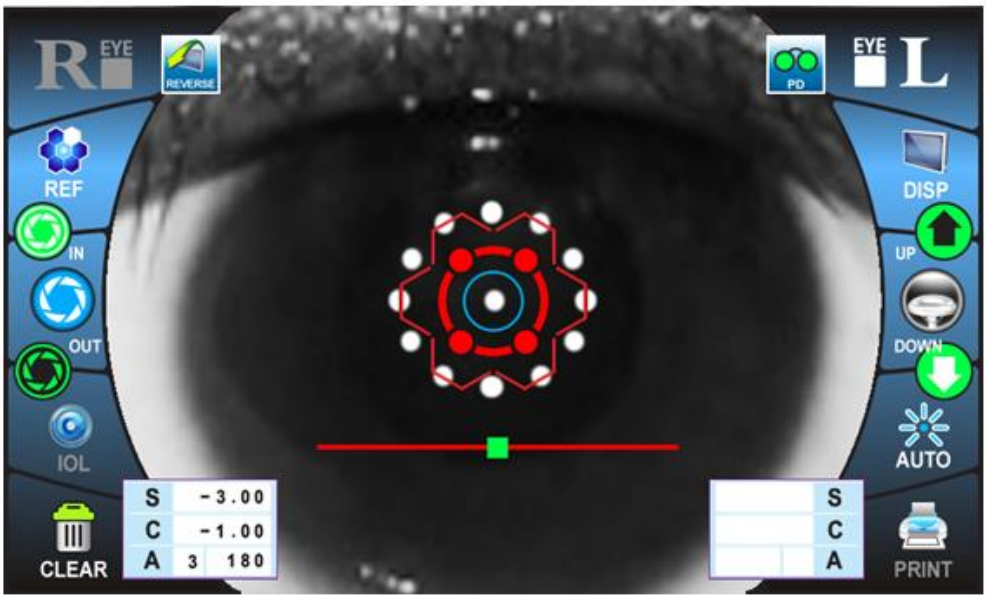
5) If icon is touched, the measuring unit moves to patient's left eye.



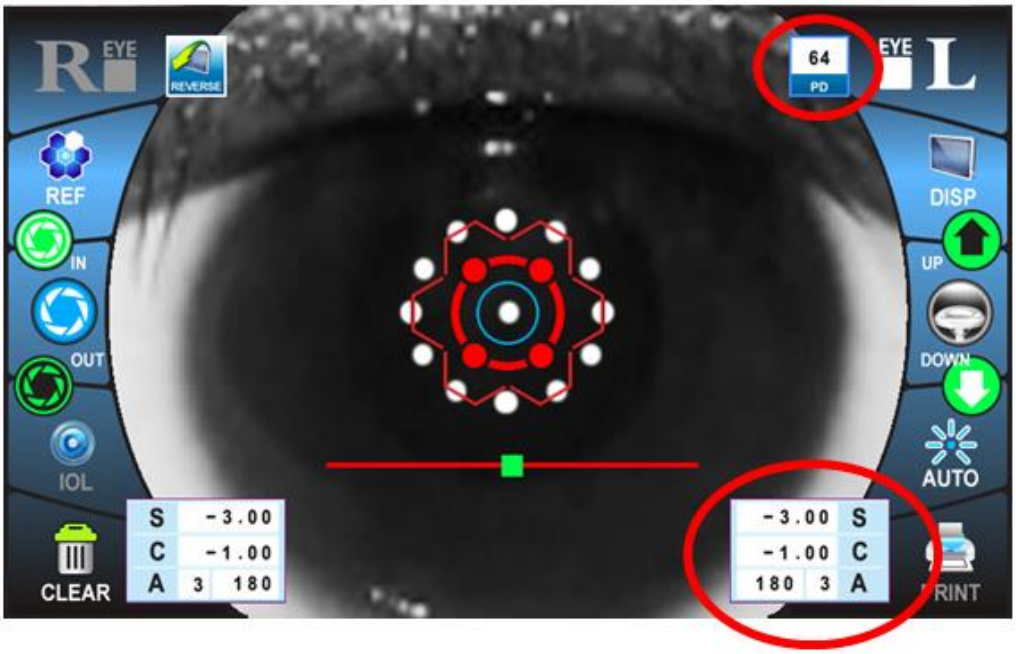
6) If the central red circle is touched, alignment is started automatically.



8) In a few seconds, the instrument begins to measure for times which is set on the MANU function.



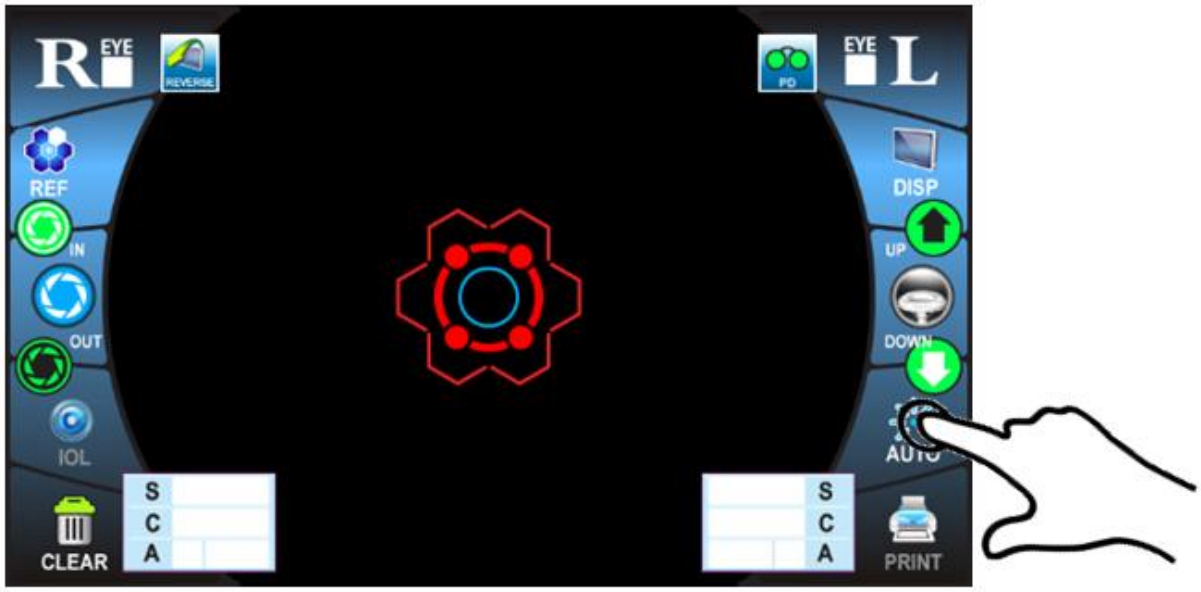
9) When both eyes measurement is complete, the result displays with PD value as follows:



NOTE	If Auto measurement mode does not work, select Manual measurement mode. Auto measurement mode may not work depending on the corneal conditions.

11.2.2 SEMI-AUTO MEASUREMENT

11.2.2.1 SELECTING THE SEMI-AUTO ALGINMENT FUNCTION



1) Check the measurement screen. If

icon appears on the screen, the semi-auto measurement function is executed.

2) If

or

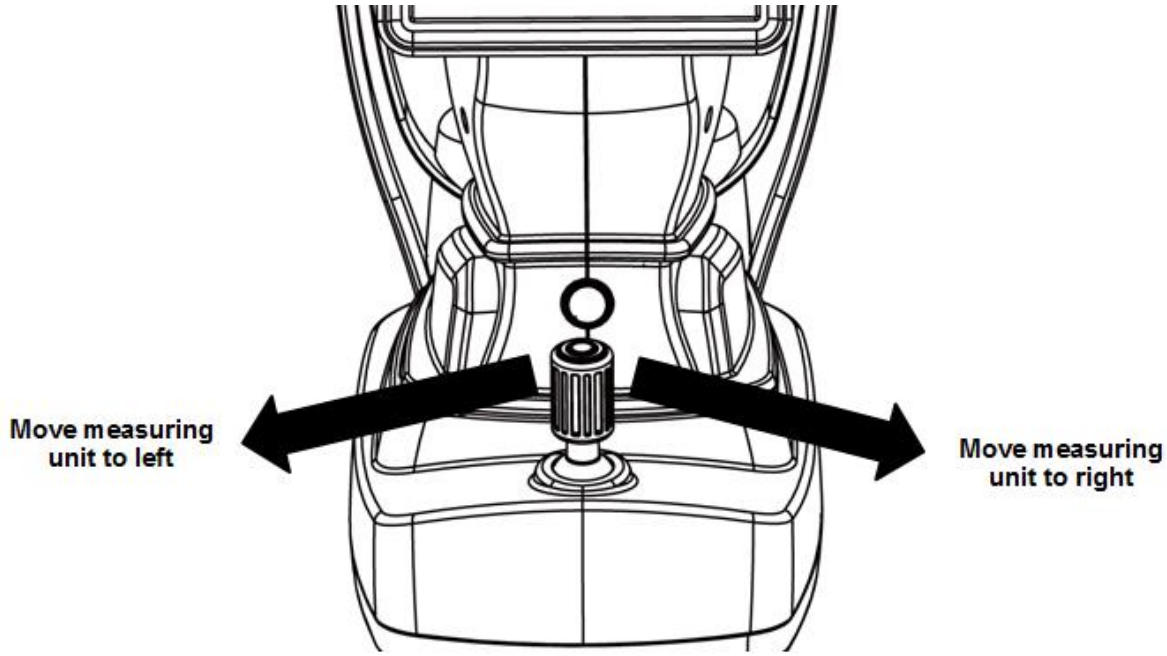
icon is displayed, touches that icon to change to

icon.

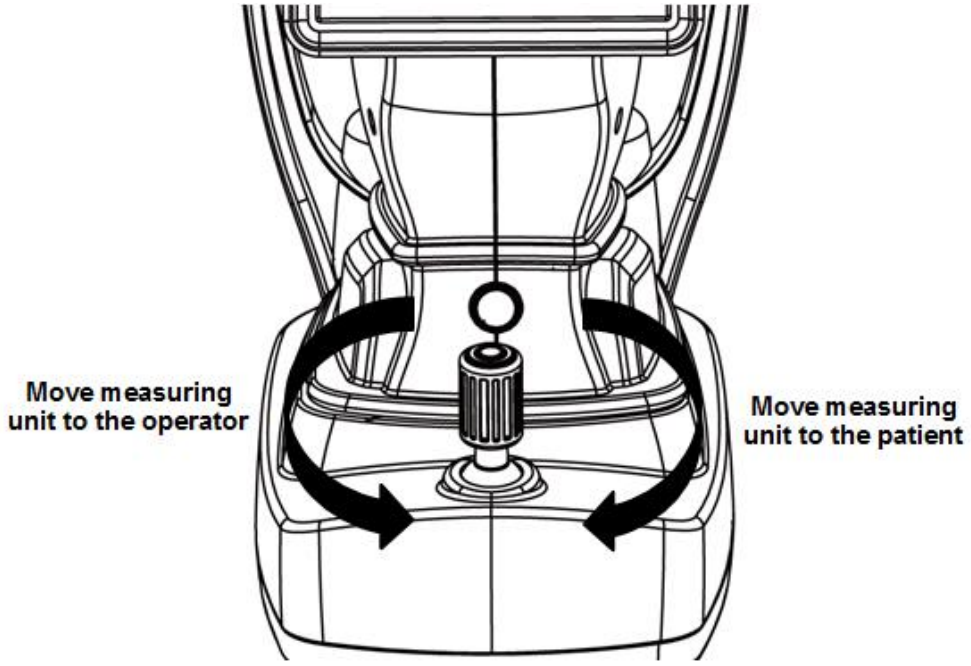
11.2.2.2 ALIGNMENT

11.2.2.2.1 ALIGNING WITH JOYSTICK

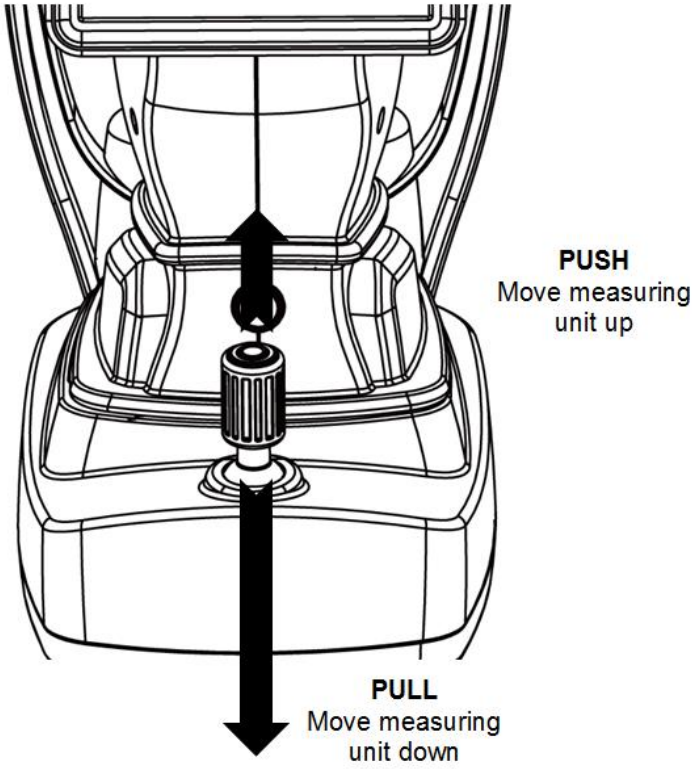
1) The position of measuring unit can be adjusted horizontally by inclining the joystick to left or right.



2) The position of measuring unit can be adjusted laterally by turning the joystick clockwise or counterclockwise.

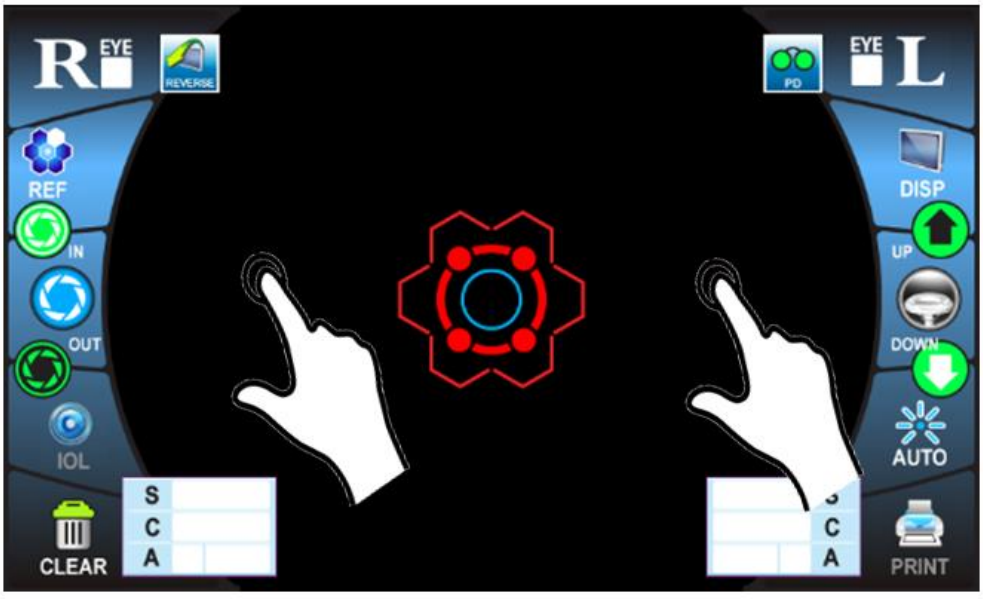


3) The position of measuring unit can be adjusted vertically by inclining the joystick to forward or backward.



11.2.2.2.2 ALIGNING WITH TOUCH PANEL

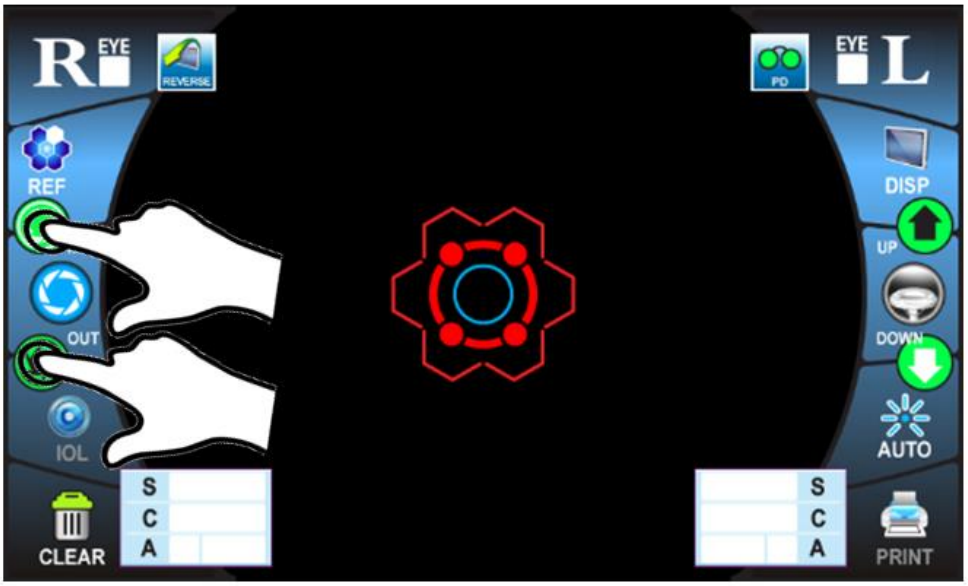
1) The position of measuring unit can be adjusted horizontally by touching left/right side of touch panel.



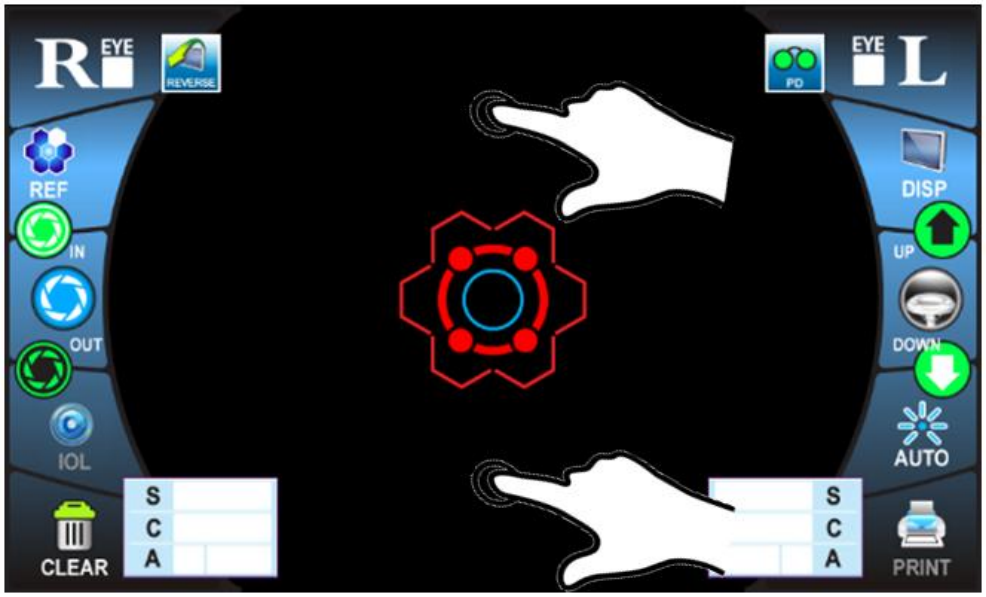
2) The position of measuring unit can be adjusted laterally by touching

and

icon of the touching panel.



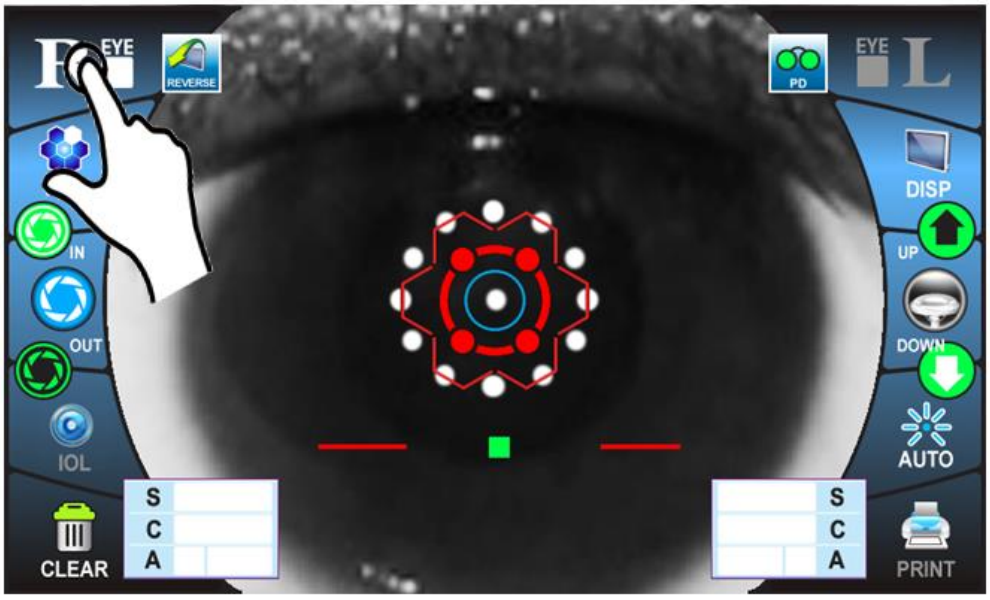
3) The position of measuring unit can be adjusted vertically by touching upper/bottom of touch panel.



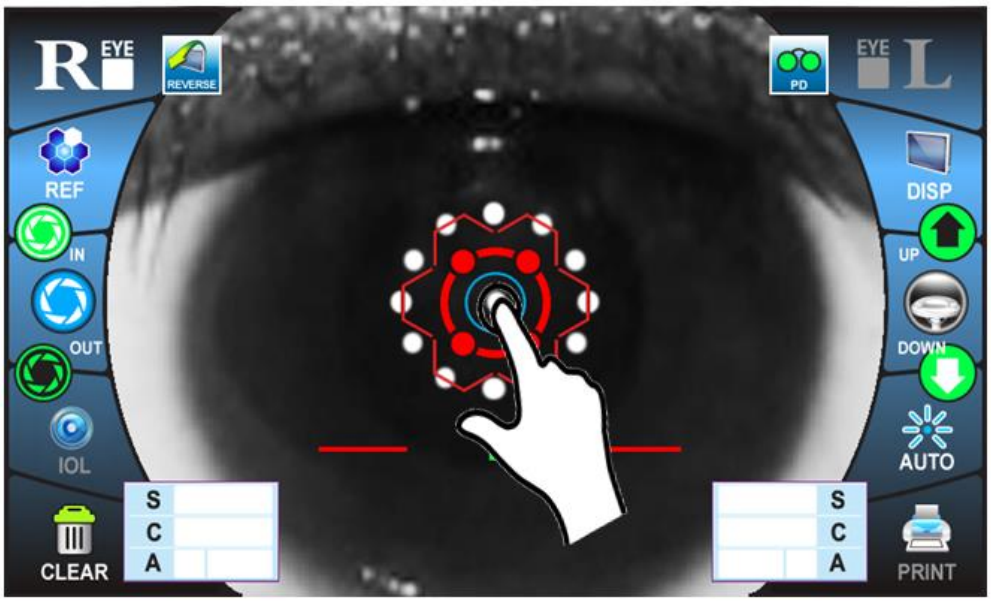
11.2.2.3 MEASUREMENT

1) If

icon is touched, measuring unit is moved to patient's right eye.

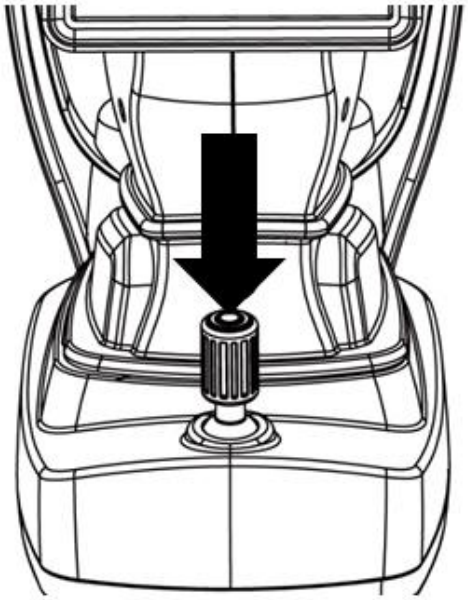


2) If the central red circle is touched, alignment is started automatically.

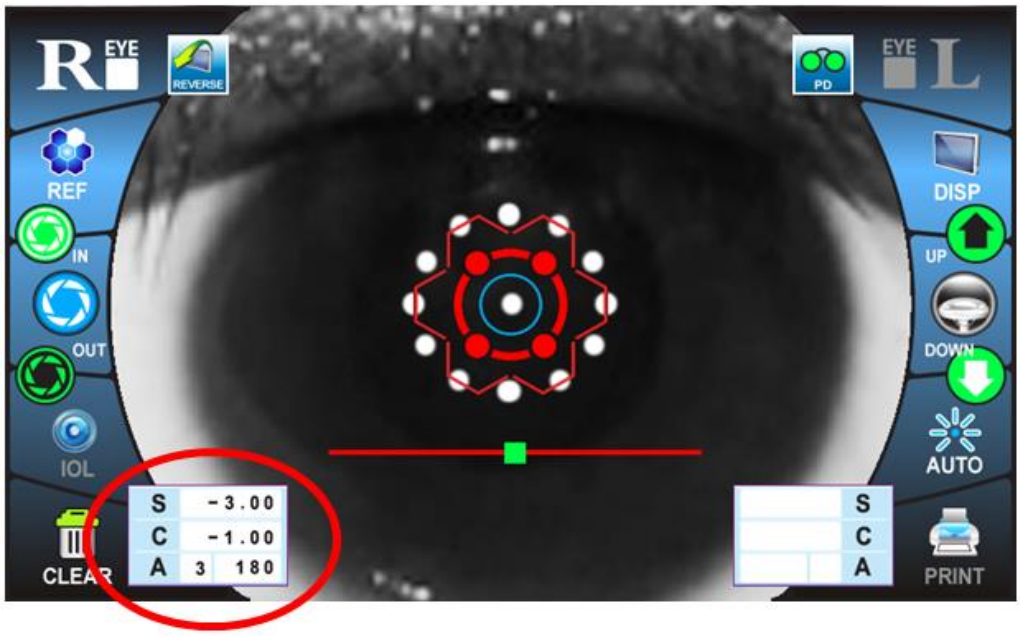


NOTE	If the focus is out of focus or measurement is not carried out even though central red circle is touched, please touch the central red circle again until the measurement is started.
	If the pupil diameter is less than 2.0 mm, the measurement value is not appeared on the screen.

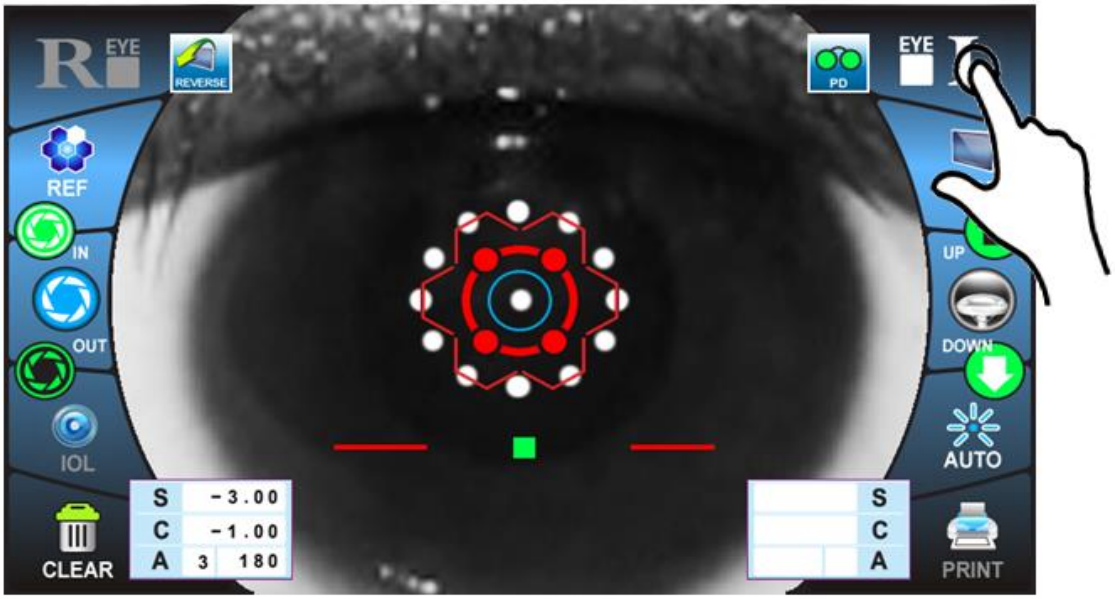
3) The instrument begins to measure, if the measurement button is pressed on the joystick after alignment.



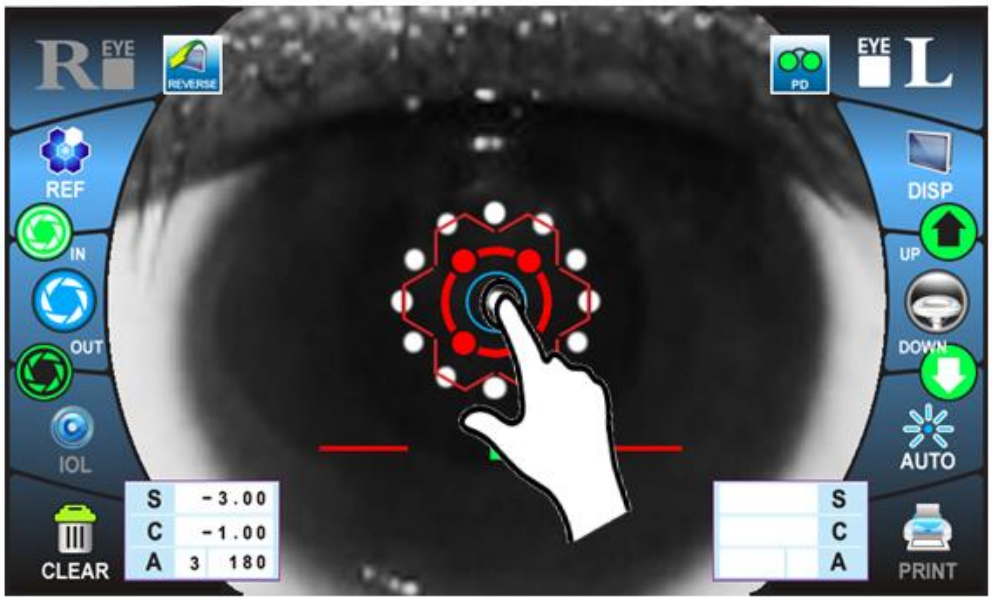
4) When the right eye measurement is complete, the result displays as follows:



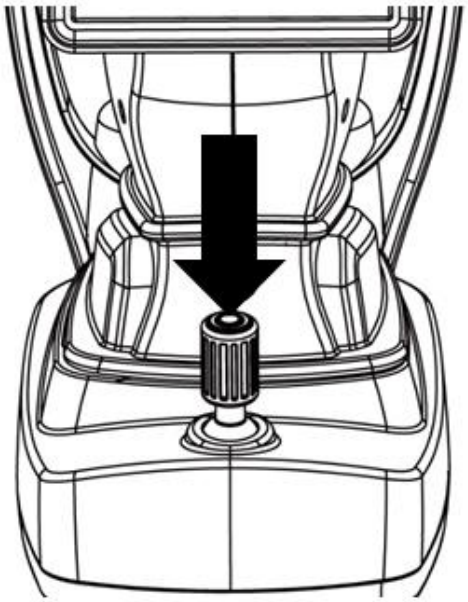
5) If icon is touched, the measuring unit moves to patient's left eye.



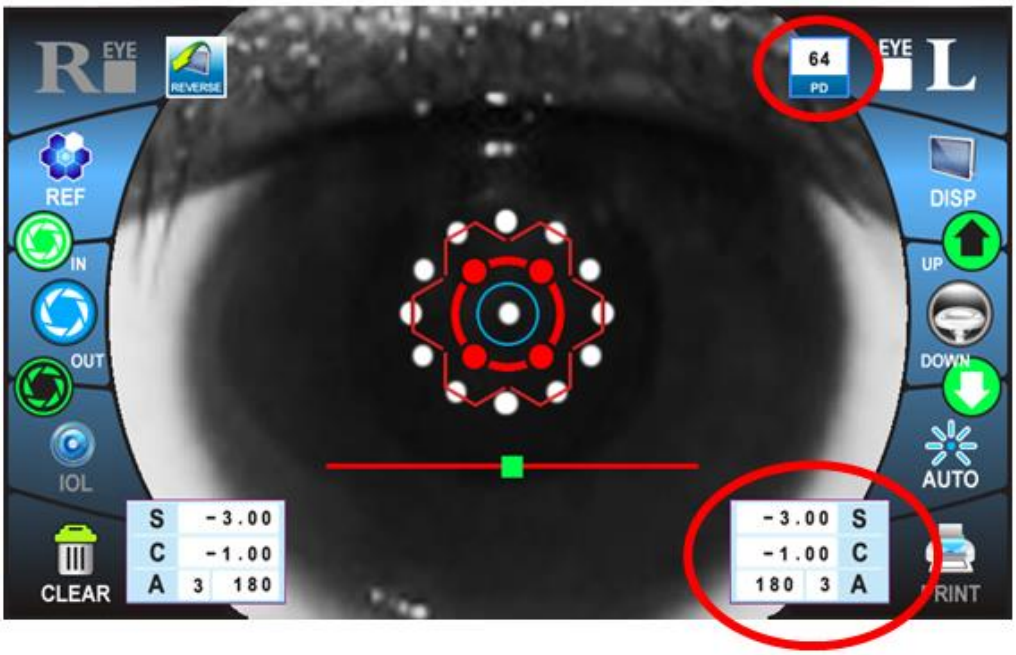
6) If the central red circle is touched, alignment is started automatically.



8) The instrument begins to measure, if the measurement button is pressed on the joystick after alignment.

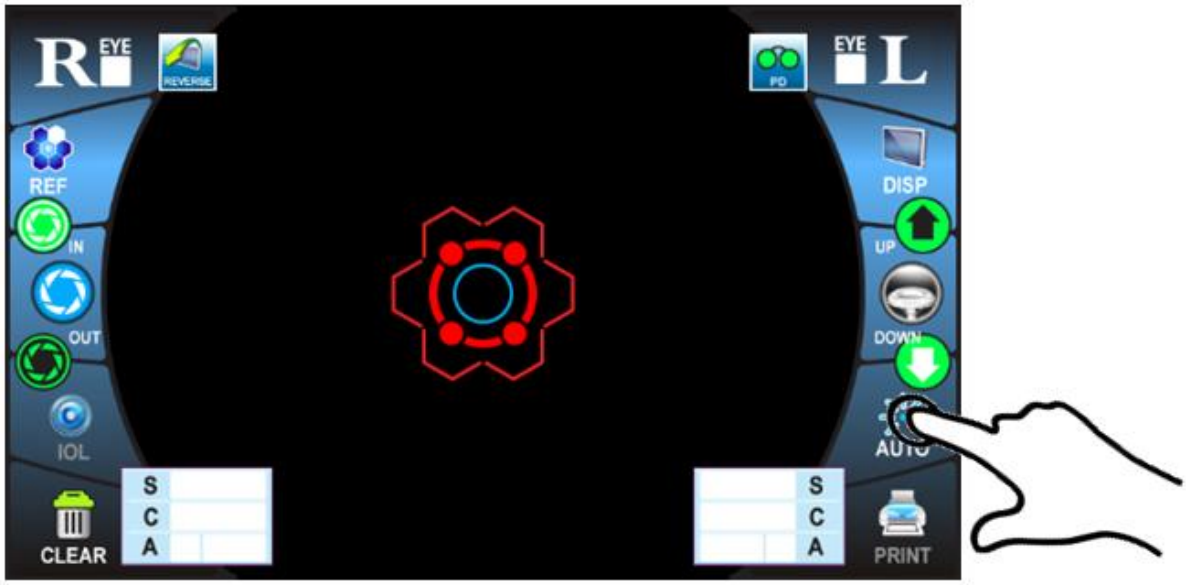


9) When both eyes measurement is complete, the result displays with PD value as follows:



11.2.3 MANUAL MEASUREMENT

11.2.3.1 SELECTING THE MANUAL ALIGNMENT FUNCTION



1) Check the measurement screen. If

icon appears on the screen, the manual measurement function is executed.

2) If

or

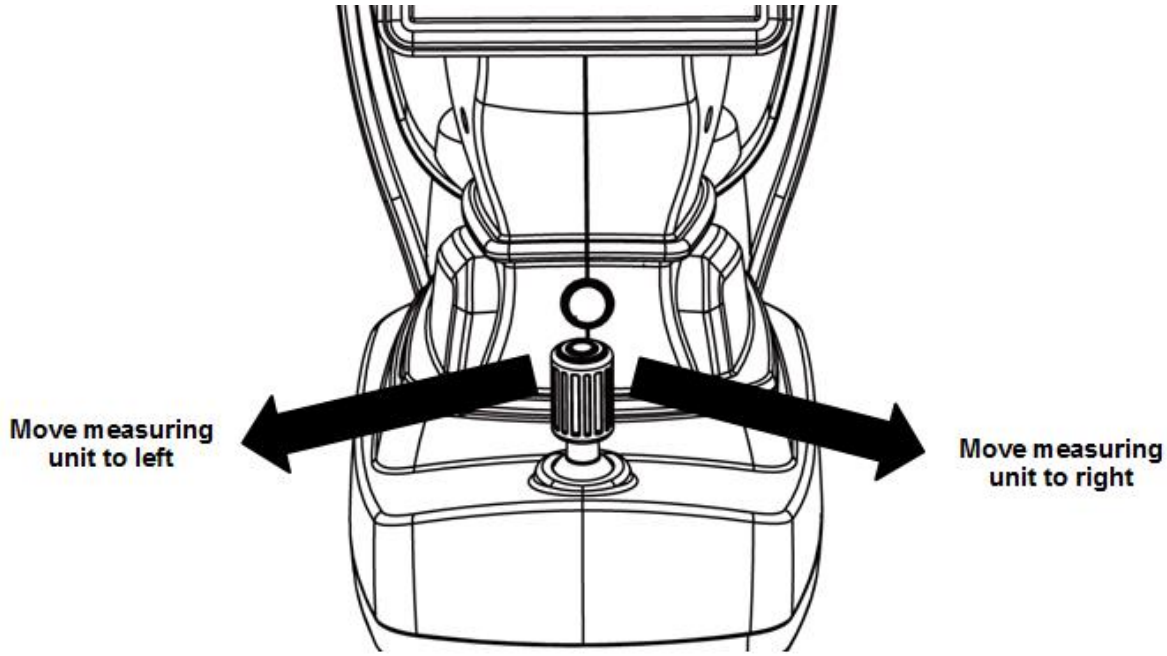
icon is displayed, touches that icon to change to

icon.

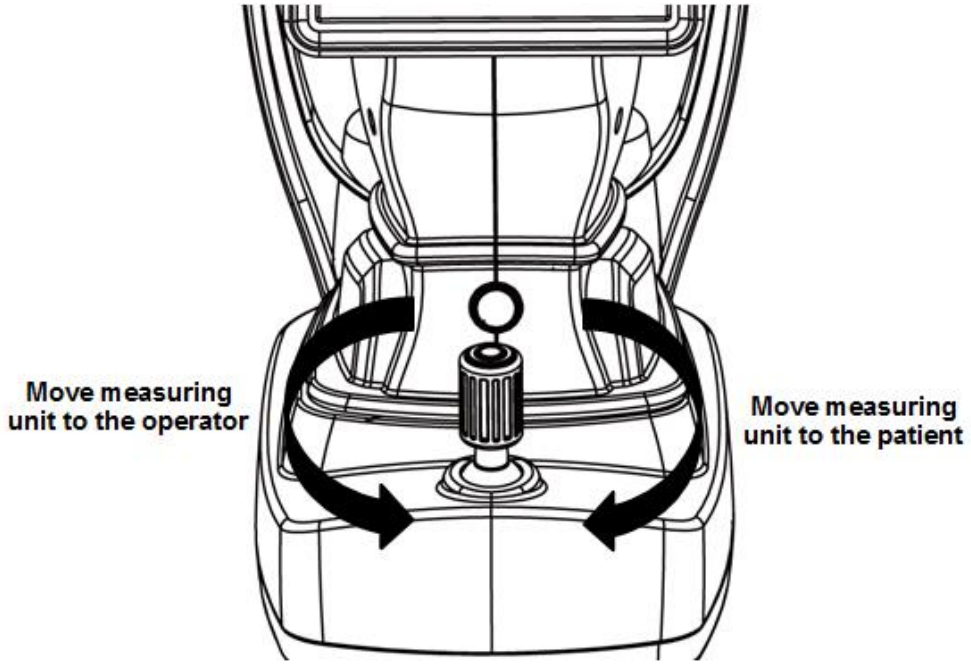
11.2.3.2 ALIGNMENT

11.2.3.2.1 ALIGNING WITH JOYSTICK

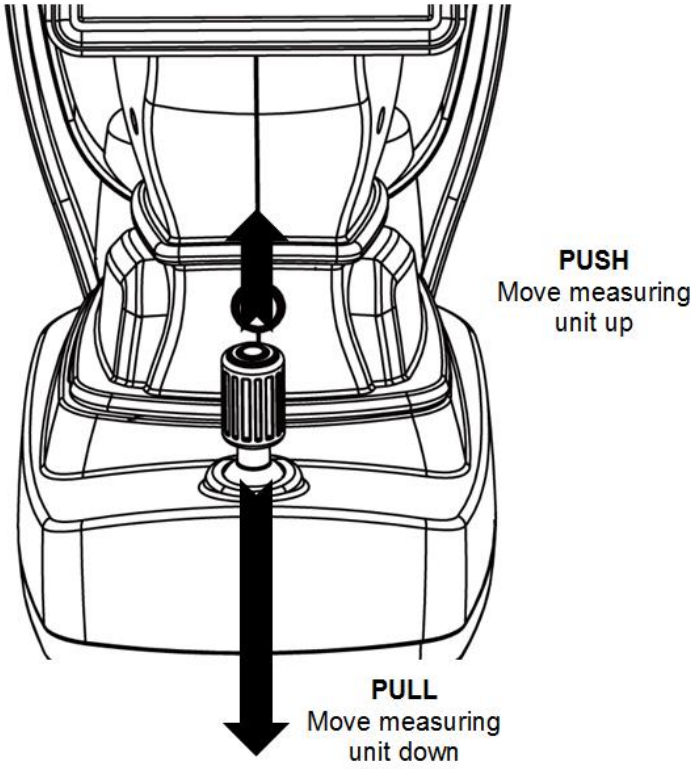
1) The position of measuring unit can be adjusted horizontally by inclining the joystick to left or right.



2) The position of measuring unit can be adjusted laterally by turning the joystick clockwise or counterclockwise.

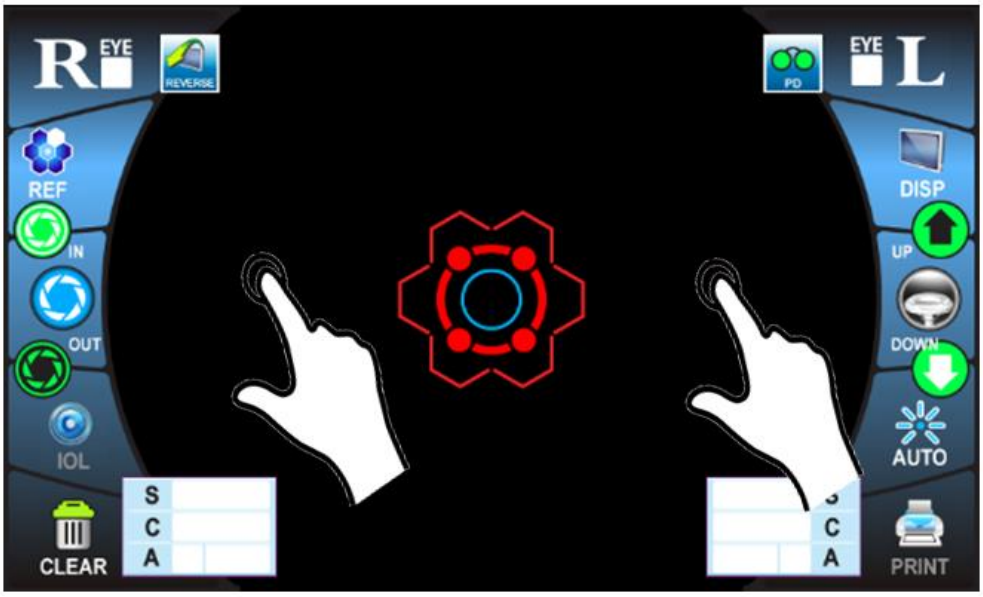


3) The position of measuring unit can be adjusted vertically by inclining the joystick to forward or backward.



11.2.3.2.2 ALIGNING WITH TOUCH PANEL

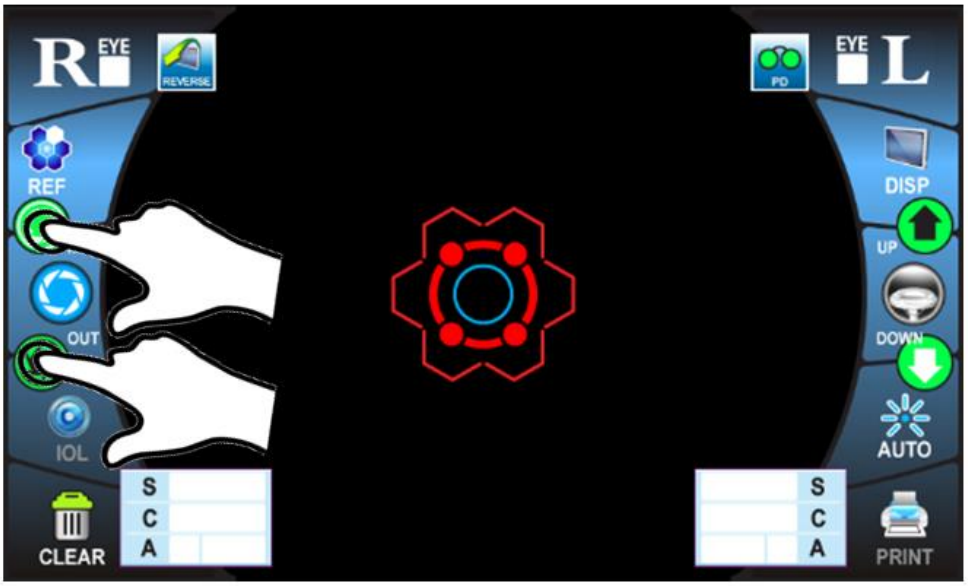
1) The position of measuring unit can be adjusted horizontally by touching left/right side of touch panel.



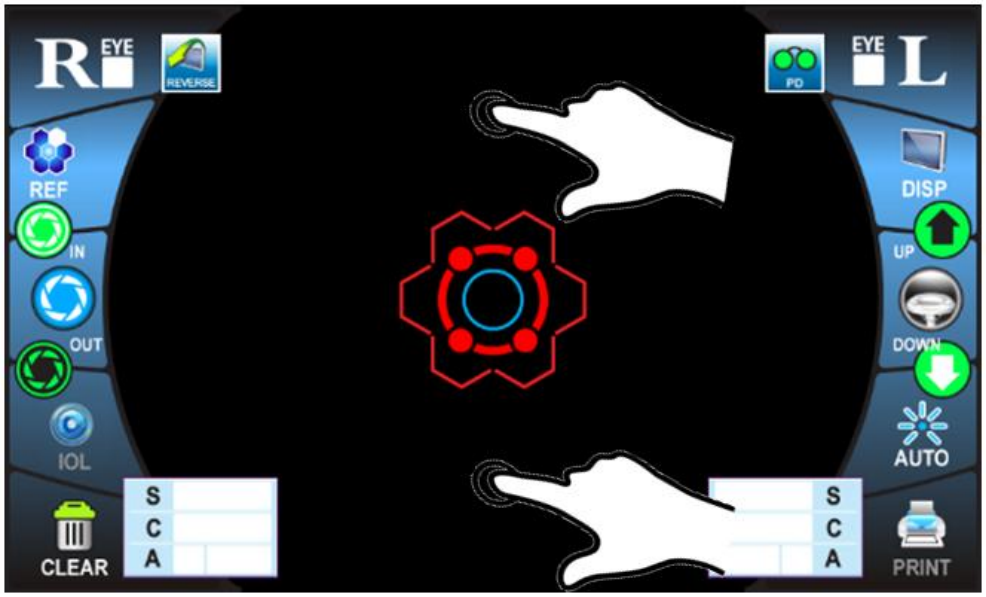
2) The position of measuring unit can be adjusted laterally by touching

and

icon of the touching panel.

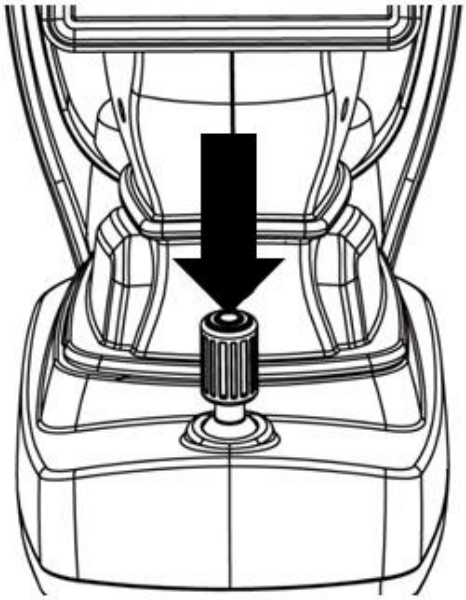


3) The position of measuring unit can be adjusted vertically by touching upper/bottom of touch panel.

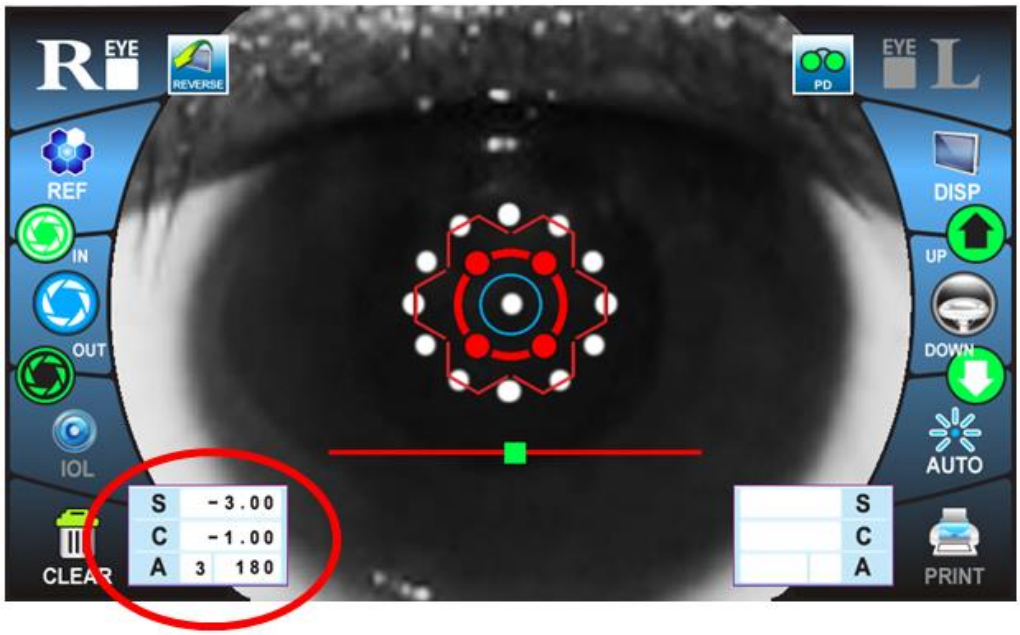


11.2.3.3 MEASUREMENT

1) The instrument begins to measure, if the measurement button is pressed on the joystick after alignment.

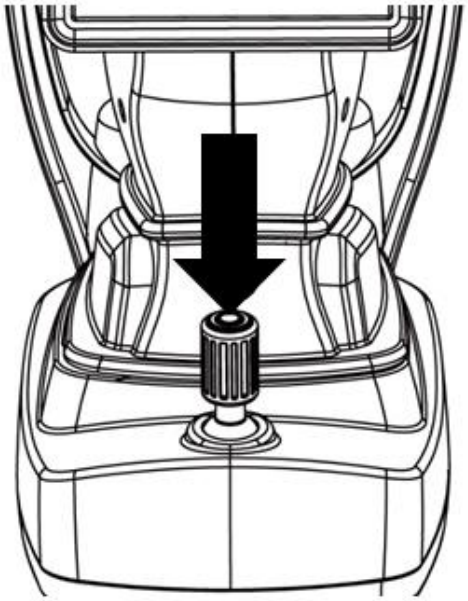


2) When the right eye measurement is complete, the result displays as follows:

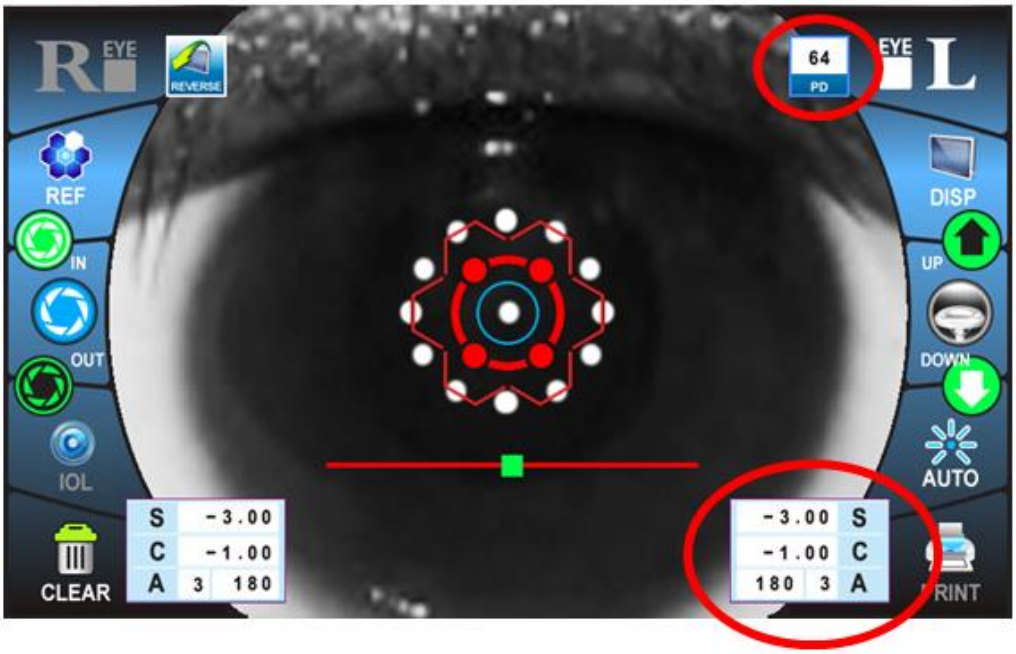


2) Move the measuring unit to patient's left eye.

3) The instrument also begins to measure, if the measurement button is pressed on the joystick after alignment.



4) When both eyes measurement is complete, the result displays with PD value as follows:



NOTE	If the pupil diameter is less than 2.0 mm, the measurement value is not appeared on the screen.

NOTE

COMPARATIVE TABLE FOR MEASUREMENT FUNCTION

	Alignment	Focusing	Measurement
AUTO	AUTO		
SEMI-AUTO	AUTO		MANUAL
MANUAL	MANUAL		

11.3 KER MEASUREMENT

	CAUTION
	When operating the instrument, be careful that it does not touch the patient's face. If it touches, wipe the instrument.

NOTE	If the eyelid and eyelashes cover the pupil, AUTO MEASUREMENT mode may not be possible. In this case, tell the patient to open their eyes as wide as possible or lift the eyelid to allow for measurement.
	Auto measurement mode may not be possible due to frequent blinks or existing abnormalities in the corneal surface caused corneal disease etc.
	If the patient blinks or measurement is taken without proper alignment, the error message will be displayed on the screen.
	If "D" is selected in "m/D" option of the MENU, K1 & K2 would be displayed instead of R1 & R2 to distinguish m & D mode.

11.3.1 AUTO MEASUREMENT

SEE "11.2.1 AUTO MEASUREMENT"

11.3.2 SEMI-AUTO MEASUREMENT

SEE "11.2.2 SEMI-AUTO MEASUREMENT"

11.3.3 MANUAL MEASUREMENT

SEE "11.2.3 MANUAL MEASUREMENT"

11.4 R/K MEASUREMENT

	CAUTION
	When operating the instrument, be careful that it does not touch the patient's face. If it touches, wipe the instrument.

NOTE	If the eyelid and eyelashes cover the pupil, AUTO MEASUREMENT mode may not be possible. In this case, tell the patient to open their eyes as wide as possible or lift the eyelid to allow for measurement.
	Auto measurement mode may not be possible due to frequent blinks or existing abnormalities in the corneal surface caused corneal disease etc.
	If the patient blinks or measurement is taken without proper alignment, the error message will be displayed on the screen.
	If the pupil diameter of patient's eye is less than 2.0mm, this instrument could not measure the refractive power.
	When measuring a patient who has IOL implant, IOL function should be activated by pressing the IOL button before measurement.
	If "D" is selected in "m/D" option of the MENU, K1 & K2 would be displayed instead of R1 & R2 to distinguish m & D mode.

11.4.1 AUTO MEASUREMENT

SEE "11.2.1 AUTO MEASUREMENT"

11.4.2 SEMI-AUTO MEASUREMENT

SEE "11.2.2 SEMI-AUTO MEASUREMENT"

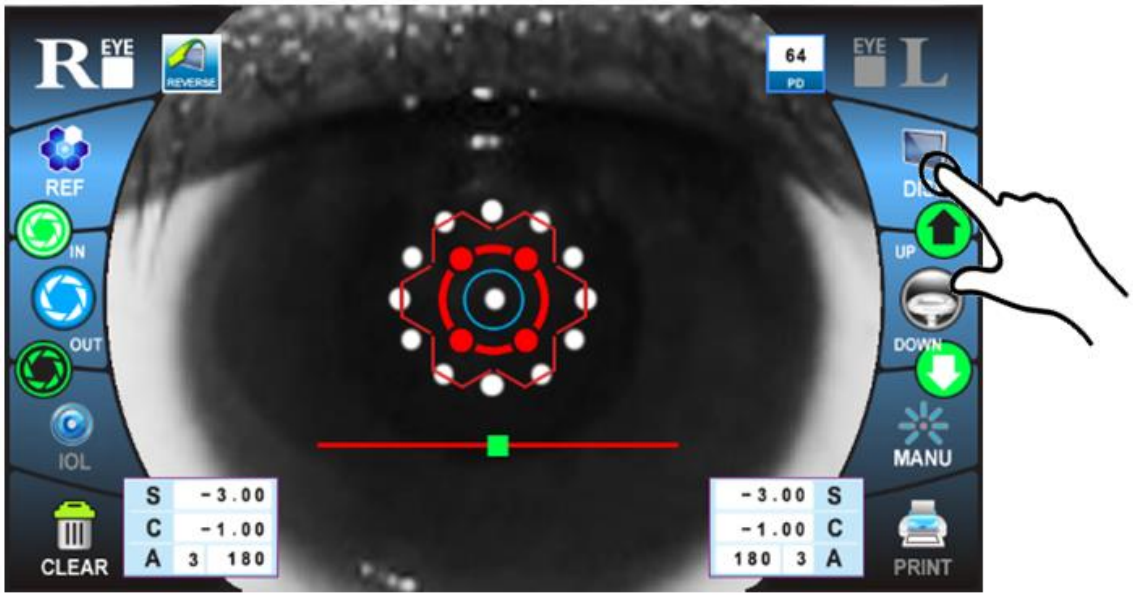
11.4.3 MANUAL MEASUREMENT

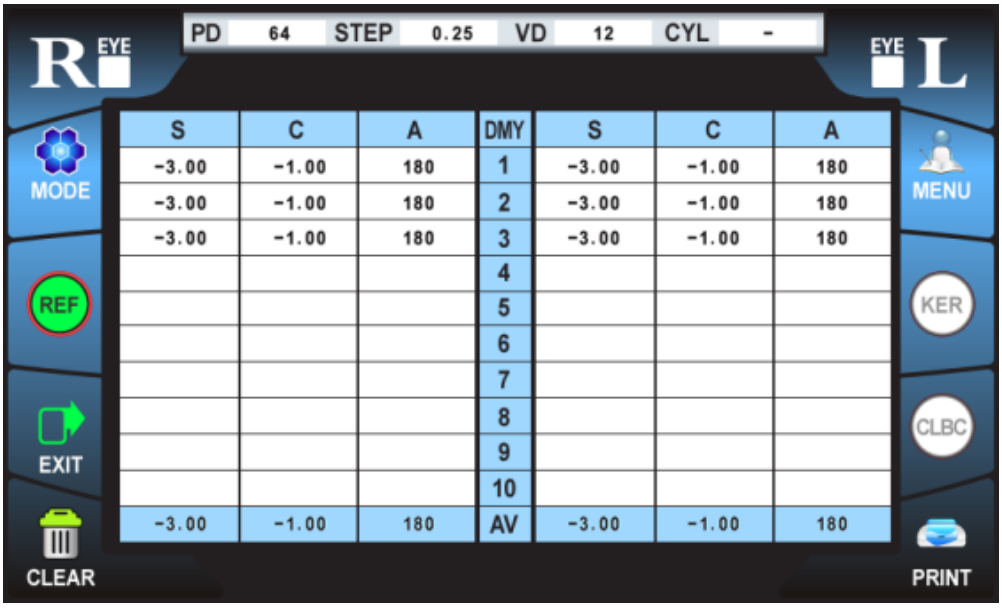
SEE "11.2.3 MANUAL MEASUREMENT"

11.5 DISPLAYING MEASUREMENT DATA

1) Touch the

icon on the touch panel after measurement, measurement data will display as follows:





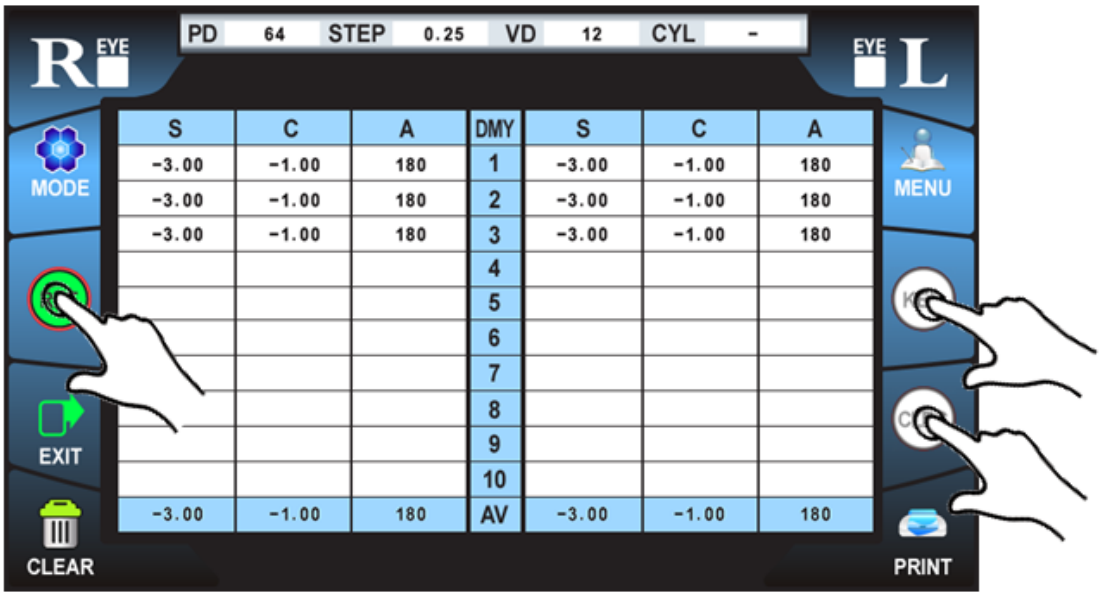
S	C	A	DMY	S	C	A
-3.00	-1.00	180	1	-3.00	-1.00	180
-3.00	-1.00	180	2	-3.00	-1.00	180
-3.00	-1.00	180	3	-3.00	-1.00	180
			4			
			5			
			6			
			7			
			8			
			9			
			10			
-3.00	-1.00	180	AV	-3.00	-1.00	180

2) If touch the

,

or

icon on the touch panel, the correspondent data will display.



S	C	A	DMY	S	C	A
-3.00	-1.00	180	1	-3.00	-1.00	180
-3.00	-1.00	180	2	-3.00	-1.00	180
-3.00	-1.00	180	3	-3.00	-1.00	180
			4			
			5			
			6			
			7			
			8			
			9			
			10			
-3.00	-1.00	180	AV	-3.00	-1.00	180

Icon	Function
	Display the refractive measurement data
	Display the keratometry measurement data
	Display the CLBC(contact lens base curve) measurement data

3) To print out or transmit to other device the measurement data, touch the

icon.

4) If the

or

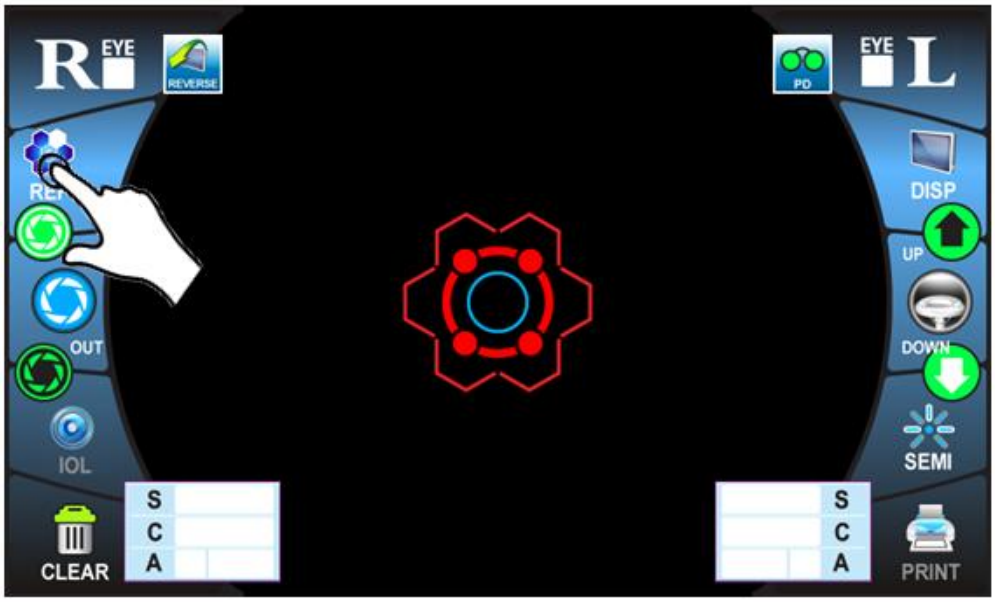
icon is touched, return to the measurement screen.

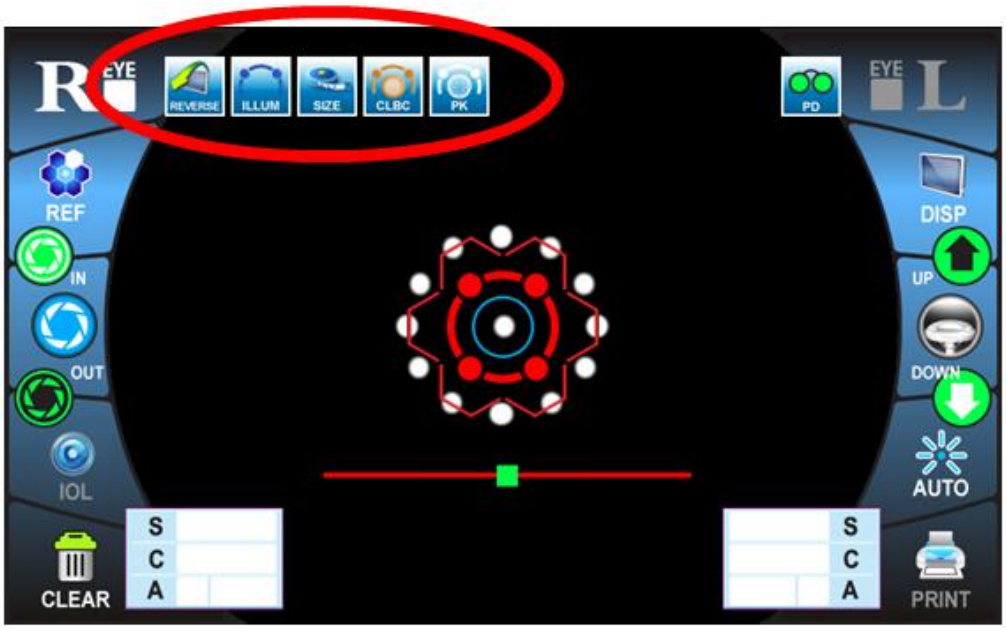
Icon	Function
	Return to the measurement screen only.
	Return to the measurement screen with clearance off all measurement data

12. ADDITIONAL OPERATION

12.1 SELECTING THE ADDITIONAL MEASUREMENT

1) If the measurement mode icon is touched, additional measurement icons are displayed on the screen as follows:





2) Touch the one of additional measurement icons on the screen that you want to measure.

Icon	Function
	RETRO-ILLUMINATION: It is available to check the condition of the cornea prior to measurement.
	CORNEA DIAMETER MEASUREMENT: Measure the diameter of cornea.
	CONTACT LENS BASE CURVE MEASUREMENT: Measure the contact lens base curve.
	PERIPHERAL KERATOMETRY MEASUREMENT: Measure the keratometry of peripheral cornea as well as central keratometry measurement.

12.2 OPERATION

12.2.1 RETRO-ILLUMINATION

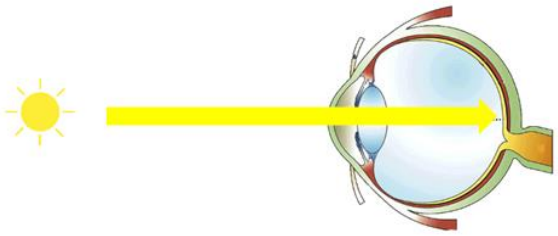
This function is available to check the condition of the cornea prior to measurement.

1) If touch the

icon, this

icon is appeared and the screen displays as follows:

Icon	Function
	Capture the screen only.
	Capture the screen after refractive measurement.
	Capture the screen after refractive measurement with IOL function.
	Display the saved image.
	Increase the value of LED brightness which is selected.

	Decrease the value of LED brightness which is selected.
	Select the LED to be adjusted.
SUBJECT	The index of captured image
REF	**The brightness of REF LED** This is the adjustable brightness for illumination which is reflected on the patient's cornea. 
ILLUM	**The brightness of AUXILIARY LIGHT** If this value is increased, the screen is bright.
TARGET	**The brightness of PATINT'S CHART** If this value is increased, the chart which can be seen by patient is brighter.

	This RETRO-ILLUMINGATION is used only for pre-checking in order to measure accuracy result. Never use for diagnosis of any diseases such as cataract, glaucoma and etc..

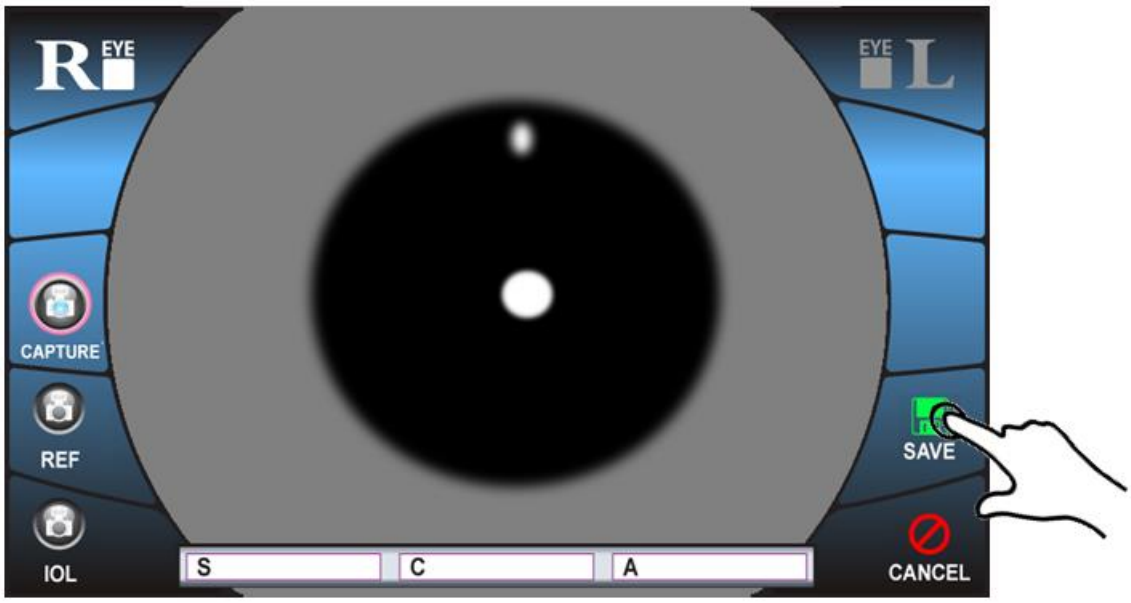
12.2.2.1 CAPTURE

1) Touch the

icon to capture the screen after alignment and focusing.

2) The captured image displays as follow. Touch the

icon to save the current image.



3) Then, touch the

icon to leave to measurement mode.

NOTE	If or is touched instead of the icon, refractive measurement result displays as follows:

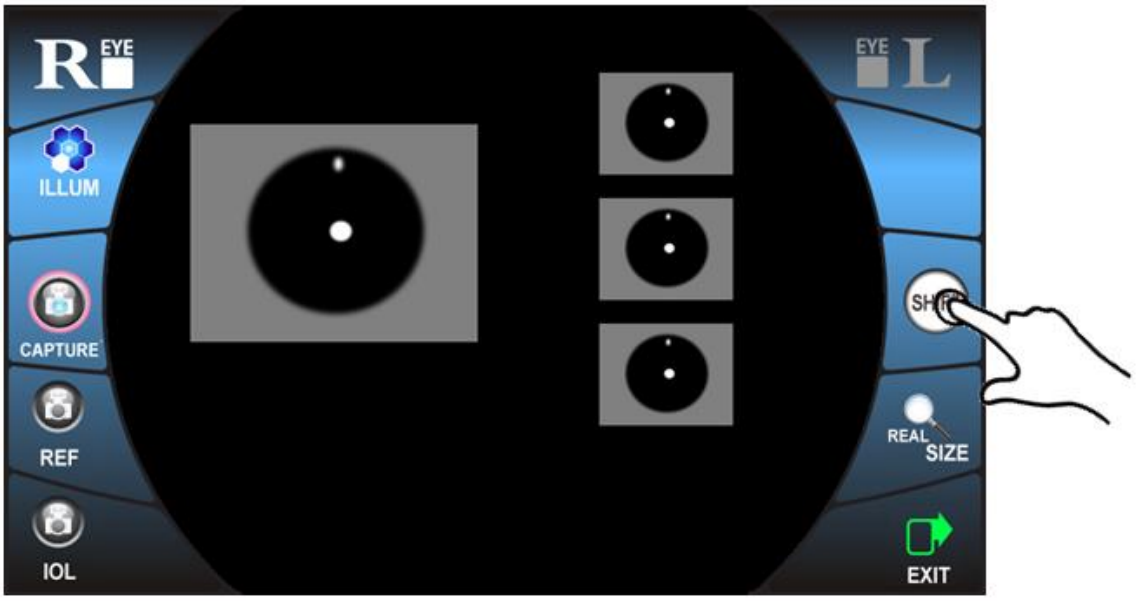
12.2.1.2 DISPLAY

1) Touch the

icon to see saved images.

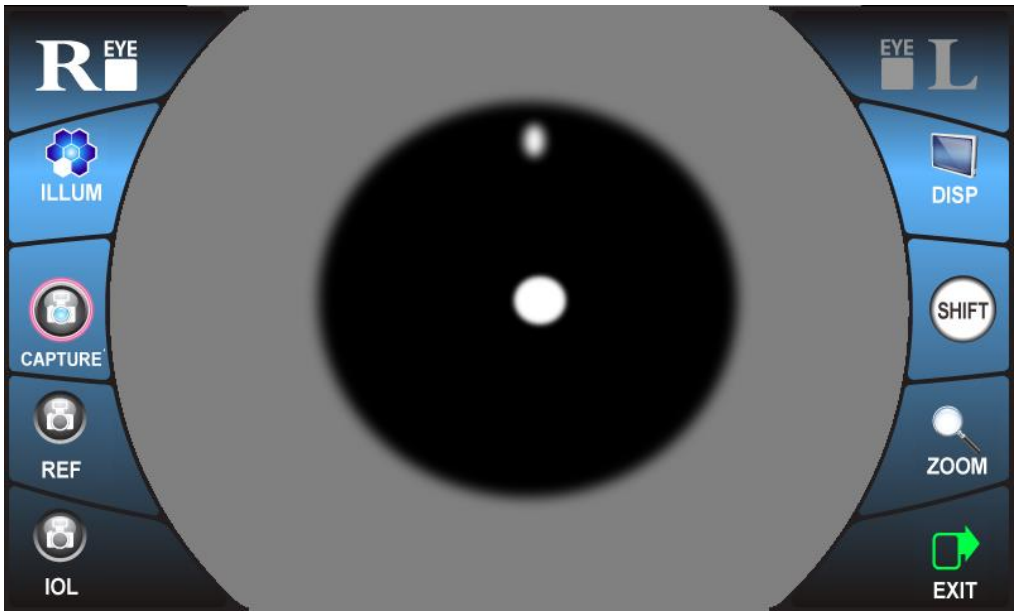
2) If

icon is touched, other saved images are displayed on the screen.



3) If the

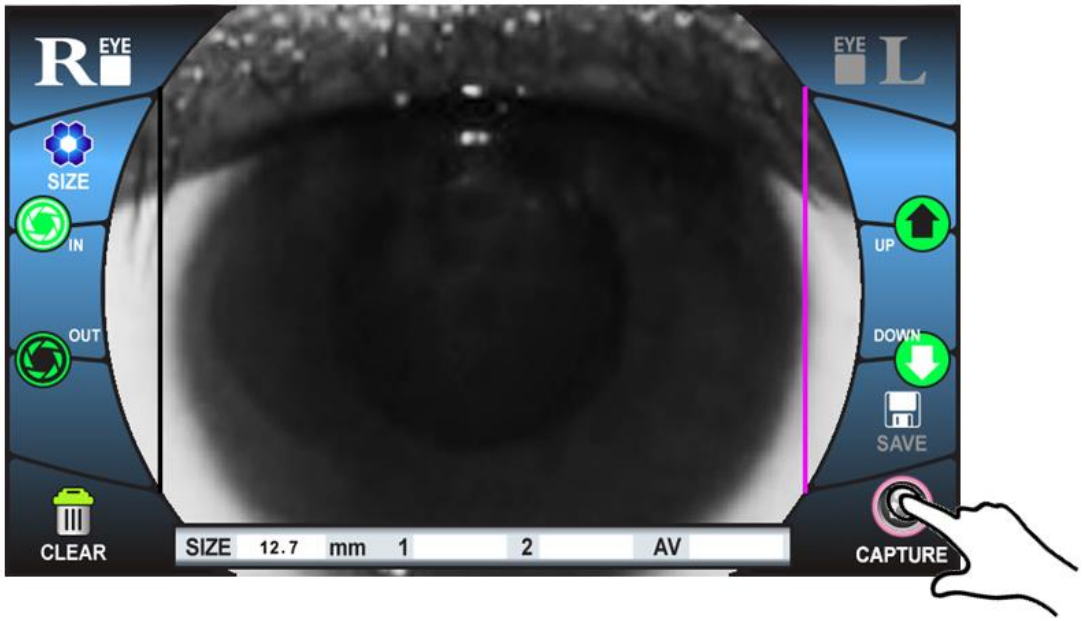
icon is touched, the original captured image is displayed on the screen as follows.



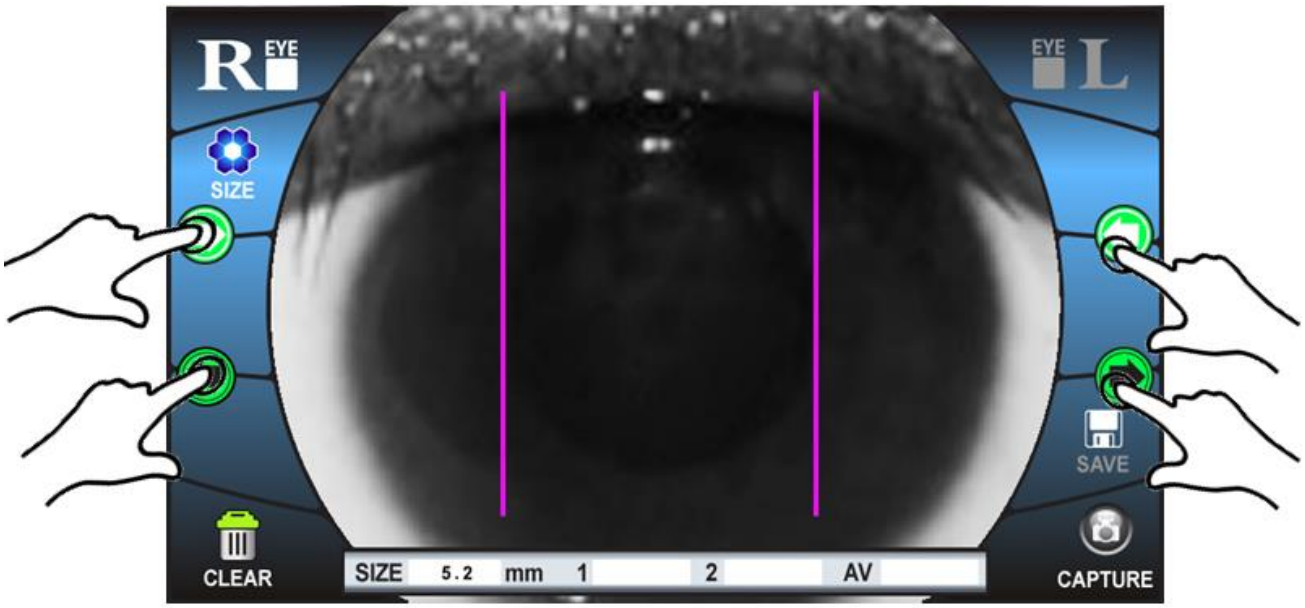
12.2.2 CORNEA DIAMETER MEASUREMENT

1) Touch the

icon to get the still image on the screen.



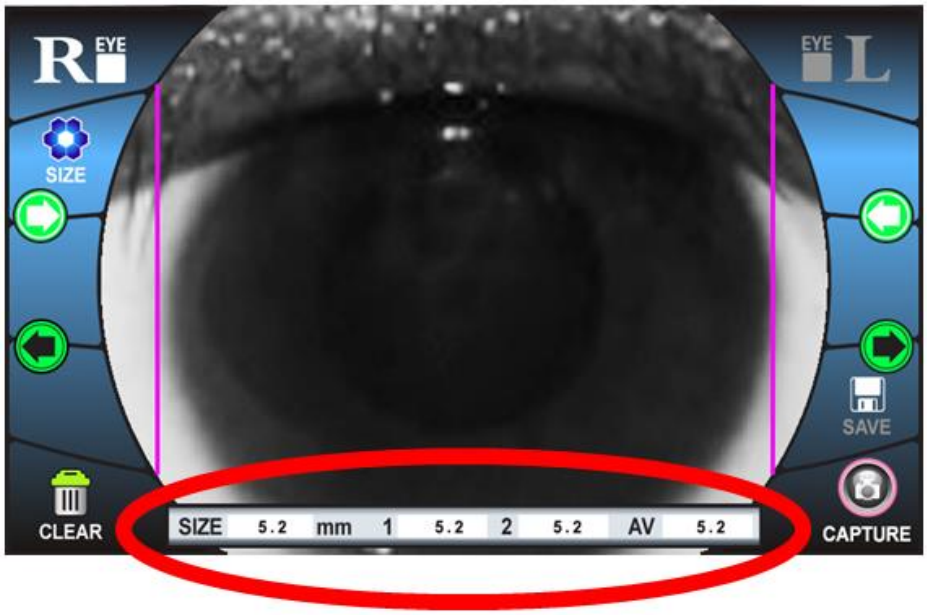
2) If the captured image is displayed, move vertical positions of two violet bars using this or icon until violet bars meet both edges of cornea.



3) If the

icon is touched, the measured value is saved and displayed on the result box.

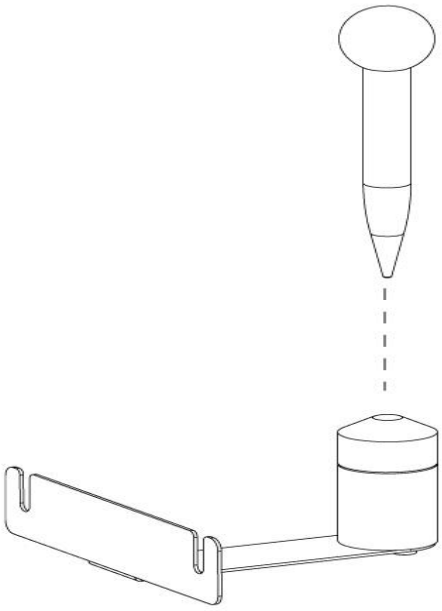
4) Perform measuring cornea diameter again to get the correct value. When the measurement is completed, average value is displayed on the result box.



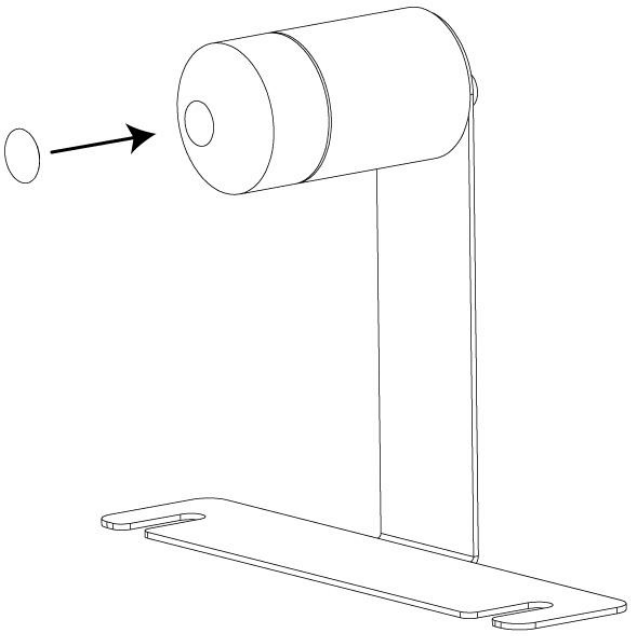
12.2.3 CONTACT LENS BASE CURVE MEASUREMENT

12.2.3.1 ATTACHING CONTACT LENS

1) Put a little water on the concave surface of the model eye as follows.

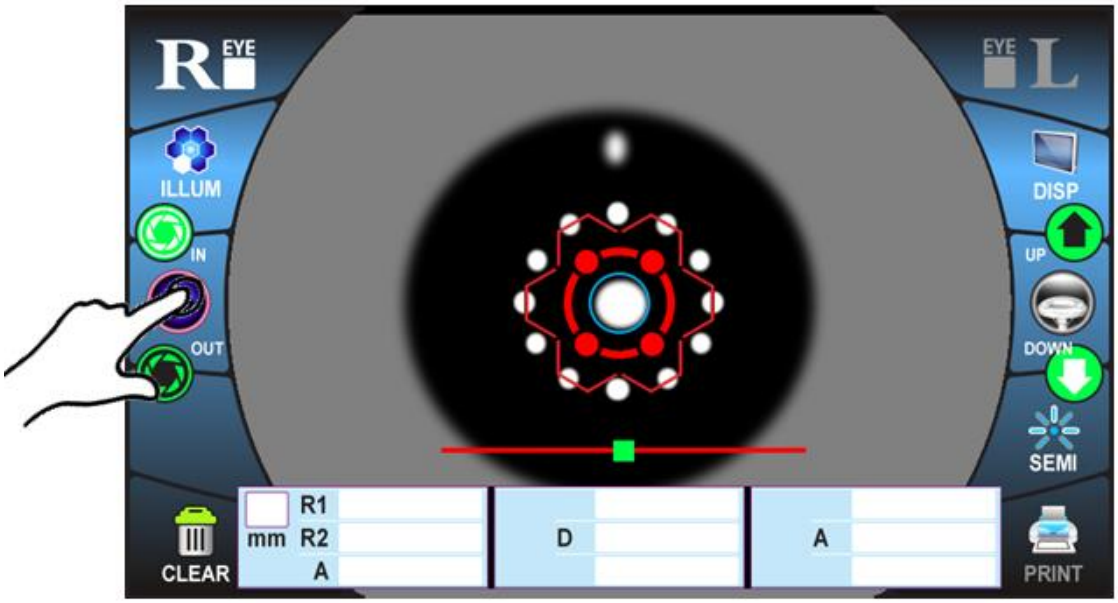


2) Attach the contact lens on the model eye cap.

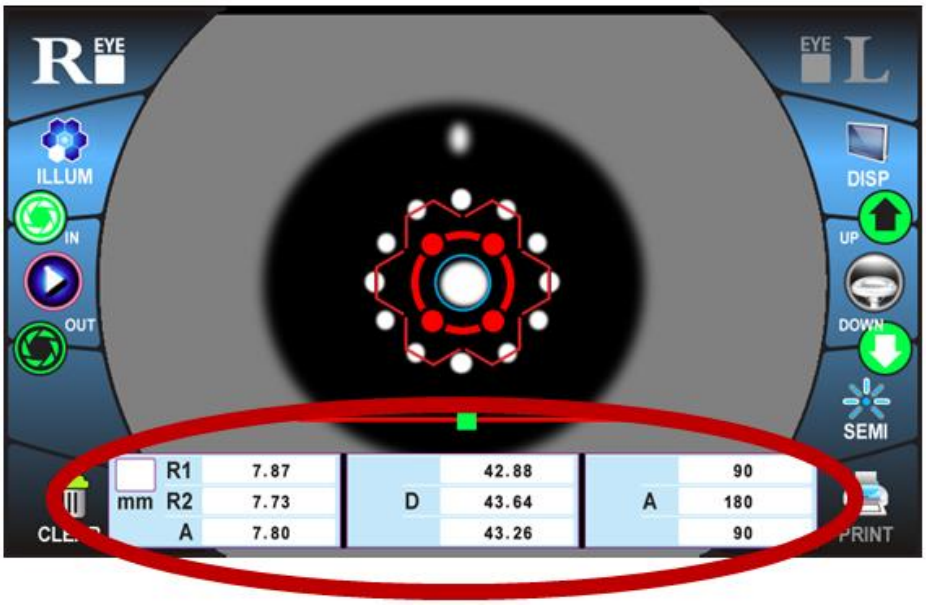


12.2.3.2 MEASUREMENT

1) After alignment and focusing as “11.2.2 ALIGNMENT”, touch the icon on the screen.



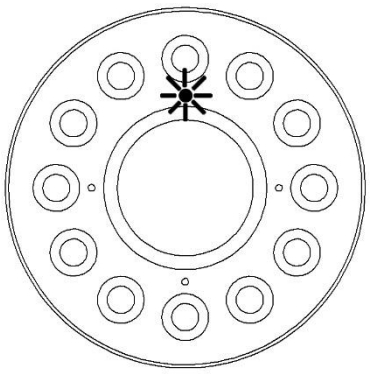
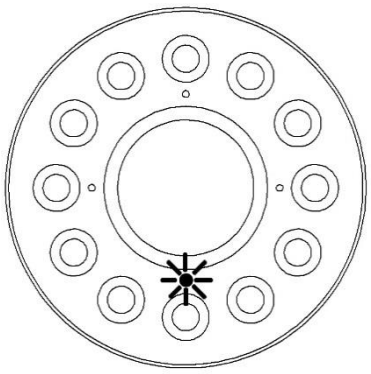
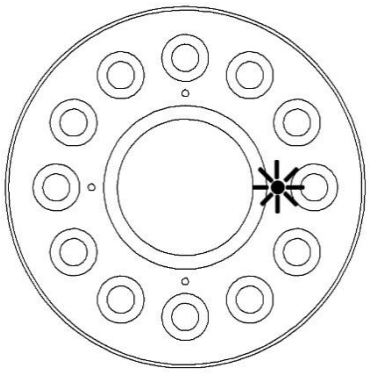
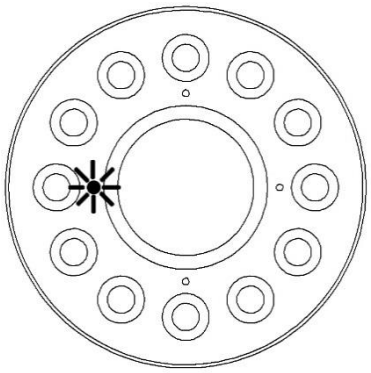
2) After measurement, its data is displayed on the result box as follows.



12.2.4 PERIPHRAL KERATOMETRY MEASUREMENT

1) The central keratometry measurement is performed in the same way as the refractive measurement.

2) Let the patient look at the green lights and perform peripheral keratometry measurement as following procedure.

 Inferior	 Superior
 Nasal/Temporal	 Nasal/Temporal

NOTE	When the peripheral keratometry measurement, advice the patient to turn pupil only, not forehead.

13. AFTER USE

1) Move measuring unit to place properly on the center of vase unit by touching the touch panel or operating joy stick.

2) Turn off the power switch (O).

NOTE	When external devices are connected with the instrument, turn off the power of both devices. (If power switch is provided.)

3) Unplug the power cord from a 3 pins AC inlet with grounding.

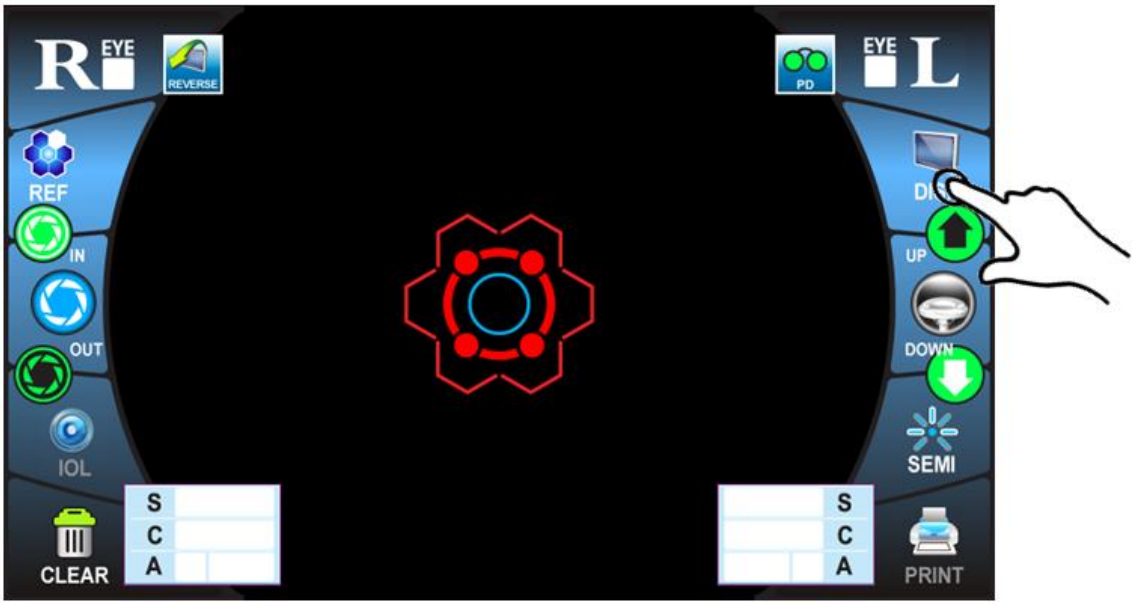
	CAUTION
	Never touch any parts related to electricity with wet hands.

NOTE	When the instrument is not used for a long period, unplug the power cord and detach the cable connected to the external interface ports.

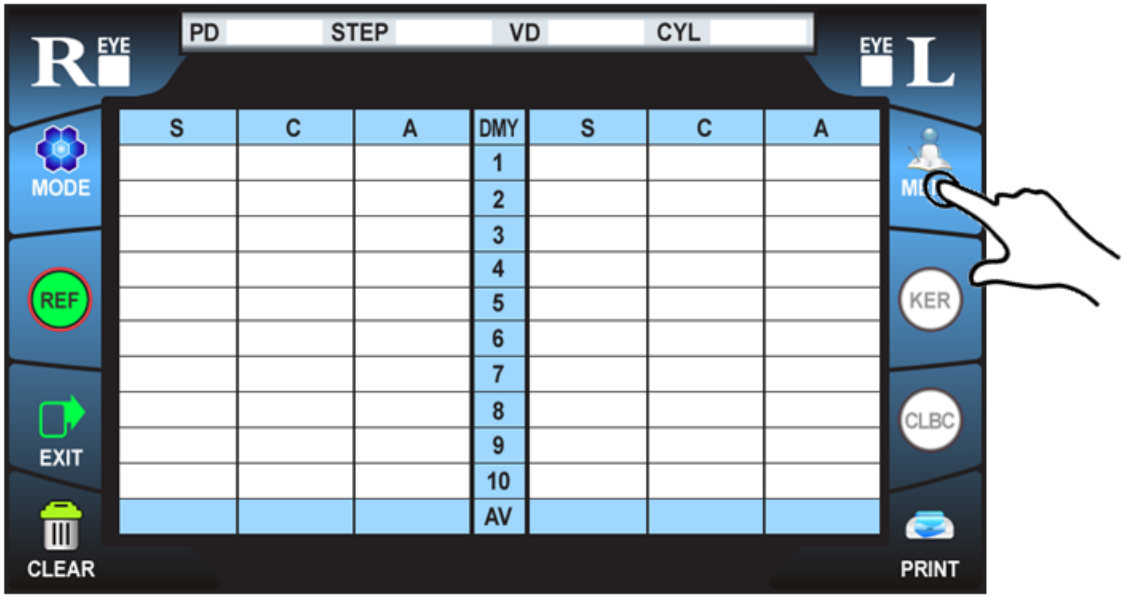
	WARNING
	When not using the instrument for extended periods of time, put the dust cover (GT-SLAC-0102) on the instrument to prevent dirty.

14. SETTING ON THE MANU SCREEN

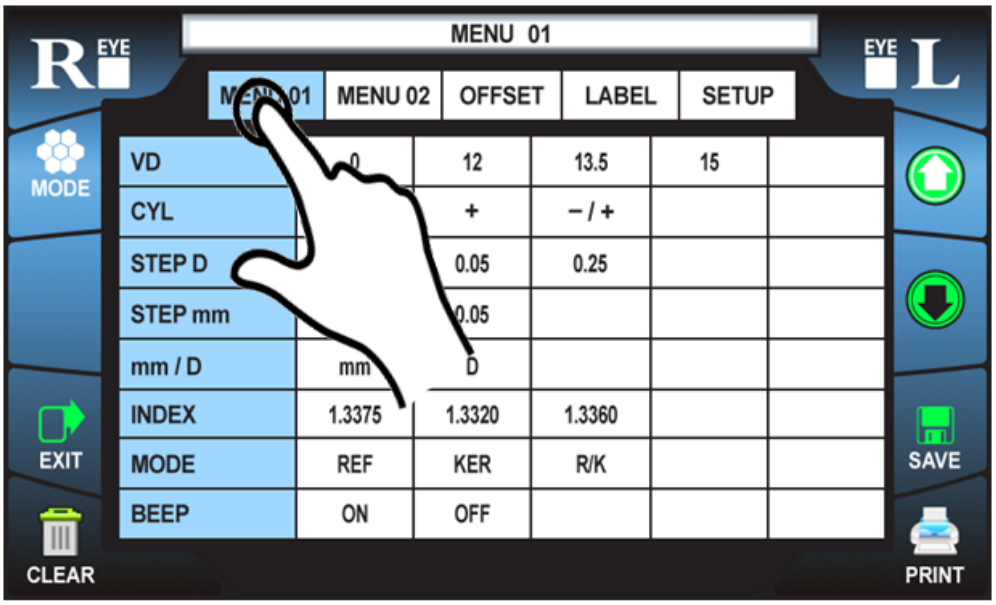
1) Touch the DISP icon on the screen of the measurement mode.



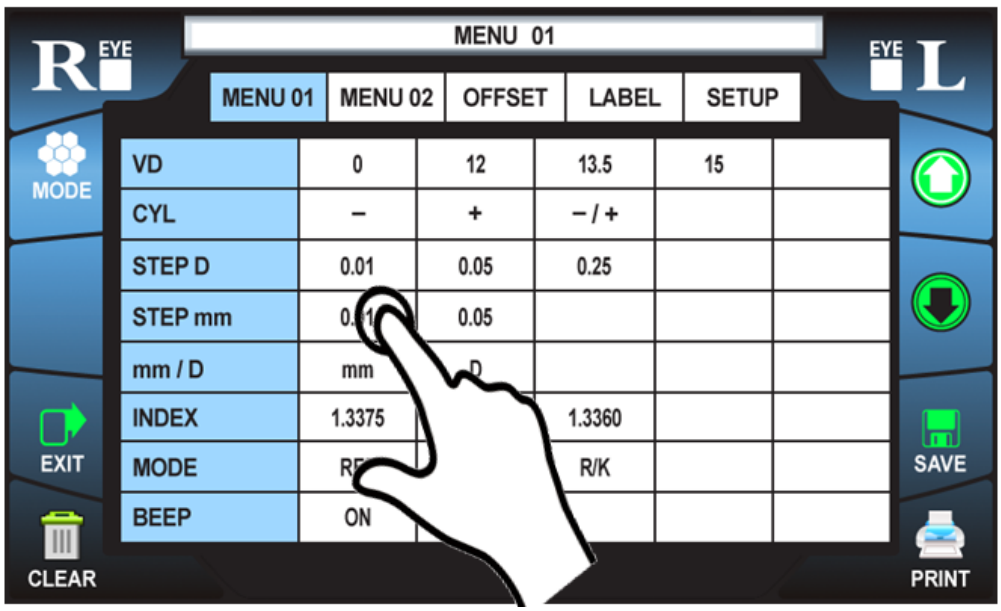
2) When displaying screen appears as below, touch the MENU icon.



3) Then, Touch the “MENU 01”, “MENU 02”, “OFFSET”, “LABEL”, or “SETUP” icon which desire to change.



4) Touch the article to be changed.



LIST OF MENU FUNCTION

Descriptions	Options	Details	Default
MENU 01 Related to the measurement conditions			
VD	0	VD value is set to 0 mm (for contact lens).	12
	12	VD value is set to 12 mm.	
	13.5	VD value is set to 13.5 mm.	
	15	VD value is set to 15 mm.	
CYL	-	The sign of astigmatic power is “-“.	-
	+	The sign of astigmatic power is “+“.	
	-/+	The sign of astigmatic power is “-“ and “+”.	
STEP D	0.01	Refractive measurement result is displayed by 0.01 D step.	0.25
	0.12	Refractive measurement result is displayed by 0.12 D step.	
	0.25	Refractive measurement result is displayed by 0.25 D step.	
STEP mm	0.01	Curvature measurement result is displayed by 0.01 mm step.	0.01
	0.05	Curvature measurement result is displayed by 0.05 mm step.	
mm / D	mm	Curvature results are printed as R1 & R2 in KER mode.	mm
	D	Curvature results are printed as K1 & K2 in KER mode.	
INDEX	1.3375	Corneal refractive index is set to 1.3375.	1.3375
	1.3320	Corneal refractive index is set to 1.3320.	
	1.3360	Corneal refractive index is set to 1.3360.	
MODE	REF	Initial measurement mode is REF when power on.	REF
	KER	Initial measurement mode is KER when power on.	
	R/K	Initial measurement mode is R/K when power on.	
BEEP	ON	Beep sounds.	ON
	OFF	Beep does not sound.	

MENU 02 Related to the measurement conditions			
NUMBER	ON	Measurement / Print number is displayed.	ON
	OFF	Measurement / Print number is not displayed.	
DATE TYPE	YMD	Date is displayed as year-month-day.	YMD
	MDY	Date is displayed as month-day-year.	
	DMY	Date is displayed as day-month-year.	
PRINT	ALL	All the measurement results are printed out.	ALL
	ECONO	Average of measurement results are only printed out.	
PRINT SEQ	REF/KER	Measurement results are printed in terms of REF or KER.	REF/KER
	LEFT/RIGHT	Measurement results are printed in terms of LEFT or RIGHT.	
PAPER CUT	AUTO	Auto cut is carried out.	AUTO
	MANUAL	Auto cut is not carried out.	
REPEAT	1	The number of continuous measurement is 1.	3
	3	The number of continuous measurement is 3.	
	5	The number of continuous measurement is 5.	
	7	The number of continuous measurement is 7.	
POWER SAVE	3 min	Power save status in 3 min after operation.	3 min
	5 min	Power save status in 5 min after operation.	
	10 min	Power save status in 10 min after operation.	
	15 min	Power save status in 15 min after operation.	
AUTO / MANUAL	AUTO-1	Initial measurement mode is auto.	AUTO-3
	AUTO-2	Initial measurement mode is auto for binocular eyes.	
	AUTO-3	Initial measurement mode is auto for binocular eyes with printing without any operation.	
	SEMI	Initial measurement mode is semi-auto.	
	MANUAL	Initial measurement mode is manual.	
OFFSET Related to adjusting of measurement results			

REF SPH		SPH value of REF measurement is adjusted.	0
REF CYL		CYL value of REF measurement is adjusted.	0
REF AXIS		AXIS value of REF measurement is adjusted.	0
KER R1		R1 value of KER measurement is adjusted.	0
KER R2		R2 value of KER measurement is adjusted.	0
KER AXIS		AXIS value of KER measurement is adjusted	0
CLBC R1		R1 value of CLBC measurement is adjusted.	0
CLBC R2		R2 value of CLBC measurement is adjusted.	0
CLBC AXIS		AXIS value of CLBC measurement is adjusted.	0
PD ADJ		PD value is adjusted.	0
LABEL Related to message function			
PRINT LABEL		Input the string of up to 48 characters.	G2 OPTIC CO.,LTD.
OFFSET Related to control of hardware & display			
LCD LIGHT		Brightness of LCE panel is adjusted.	0
FOCUS ADJ		Sensitivity of auto focus is adjusted.	30
BAUD RATE	2400	Baud rate is set to 2400 bps.	38400
	4800	Baud rate is set to 4800 bps.	
	9600	Baud rate is set to 9600 bps.	
	19200	Baud rate is set to 19200 bps.	
	38400	Baud rate is set to 38400 bps.	
	57600	Baud rate is set to 57600 bps.	
	115200	Baud rate is set to 115200 bps.	
	460800	Baud rate is set to 460800 bps.	
INTERFACE	PRINT & RSC 232C	Data are transferred to printer & RSC 232C port.	PRINT & RSC 232C
	RSC 232C ONLY	Data are transferred to RSC 232C port only.	
LANGUAGE	ENGLISH	Language of characters is set to ENGLISH.	ENGLISH
	OTHER	Language of characters is set to other.	

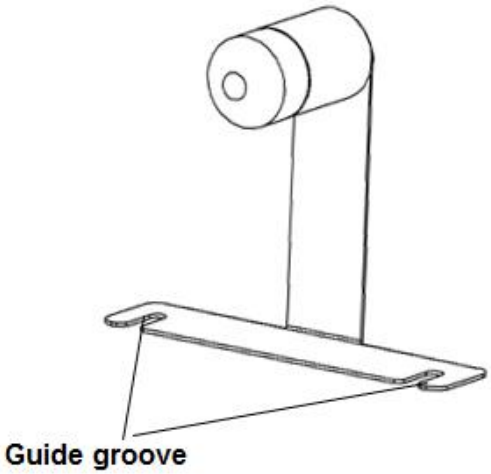
15. MAINTENANCE

15.1 DAILY CHECKUP

15.1.1 CHECKING THE MEASURING ACCURACY

1) The model eye (GT-SLAC-0103) accompanied with the instrument should be measured and the accuracy is checked at regular intervals.

2) To set up the model eye, insert the guide groove of the model eye to the chinrest paper pin.



⚠	**WARNING**
	If the measurement result differed materially, contact your local authorized dealer.

15.1.2 CLEANING THE INSTRUMET

- If dust on the measuring window, blow off dust by a blower.

- If fingerprints and oil spots on the measuring window, below off dust by a blower and wipe the surface with isopropyl alcohol using the clean gauze.

- If the instrument cover is dirty, wipe the surface with a dry soft cloth. Never use solvents or a chemical duster.

15.1.3 CLEANING THE FOREHEAD REST AND CHINREST

- Wipe the forehead rest and chinrest with a cloth moistened by a tepid solution of neutral detergent for kitchenware.

15.1.4 DAILY MAINTENANCE

- For this instrument, dust may cause the failure. When not in use, place the dust cover on the instrument.

- When not in use, turn off the power switch.

15.1.5 ORDERING CONSUMABLE ITEMS

- When ordering consumable items, tell the product name, control-code and quantity to your local authorized dealer.

Product name	Control-code
Power code	KKP-4891R
Chinrest paper	GT-SLAC-0101
Dust cover	GT-SLAC-0102
Fuse	T2AL250V

The information of all the spare parts including above items is provided in the website: www.g2optic.com.

16. TROUBLESHOOTING

MESSAGE	CAUSE	ACTION
SYSTEM ERROR	Initialization failure	Turn off the power, and then turn it on after few seconds.
EEPROM DATA ERROR		
EEROM ERROR		
MOTOR ERROR		
ERROR	Measurement failure caused by wrong alignment or not proper target.	Perform aligning correctly and measuring again.
+ OVER	Spherical value is over than +25D.	Not available to measure.
- OVER	Spherical value is lower than -25D.	
C OUT	Refractive astigmatism is over than 10D or corneal astigmatism is over than 15D.	

17. SPECIFICATIONS AND PERFORMANCE

Refractive Measurement	Sphere	-25.00 to +25.00D (VE 12mm) (0.01/0.12/0.25D steps)
	Cylinder	0 to +/-10D (0.01/0.12/0.25D steps)
	Axis	1 to 180 degree (1 degree step)
	Required minimum pupil	2.0mm
Keratometry Measurement	Radius curvature	5.00 to 10.00mm (0.01/0.05mm steps)
	Refractive power	67.50 to 33.75D (n=1.3375) (0.01/0.12/0.25D steps)
	Astigmatism	0 to +/- 15D (0.01/0.12/0.25D steps)
	Astigmatic axis	1~180 degree (1 degree step)
	Peripheral measurement	6.0mm (r=7.8)
Size Measurement (Cornea diameter)		0~12.7mm
Special Functions	PK(Peripheral Keratometry) ILLUM(Retro-illumination) SIZE(Cornea diameter) CLBC(Contact lens base curve)	
Target chart	Auto fog system with dots chart / Auto fog system with scenery chart (optional)	
Display	Tilting wide 7 inch TFT color LCD	
	Luminance 400cd/m^2	
	Resolution 800x480 pixels	
Interface	RS-232C (RX/TX), D-sub(Video out)	
Dimension	458 x 210 x 405mm	
Power supply	AC 100-240V 50/60Hz	
Power consumption	55-85 VA	

18. GENERAL INFORMATION ON USAGE

18.1 INTENDED USER PROFILE

Since the instrument SINGLE LTL is medical device, the operation should be supervised by an ophthalmologist.

18.2 ENVIRONMENTAL CONDITION OF USE

- Temperature: 10°C to 40°C
- Humidity: 10% to 90% RH (without condensation)
- Atmospheric pressure: 800 hPa to 1060 hPa

18.3 STORAGE, USAGE PERIOD

1) Storage environmental conditions (without package)

- Temperature: 10°C to 40°C
- Humidity: 10 % to 90 % RH (without condensation)
- Atmospheric pressure: 800 hPa to 1060 hPa

2) When storing the instrument, ensure that the following conditions:

- The instrument must not be splashed with water.
- Store the instrument away from environments where air pressure, temperature, humidity, ventilation sunlight, dust, salty/sulfurous air, etc. could cause damage.
- Do not store or transport the instrument on a slanted or uneven surface or in an area where it is subject to vibrations or instability.
- Do not use or store the instrument where chemicals are stored or gas is generated.

	Do not store or use in place with the following conditions: - harmful gases or polluted air; - blowing dust or sand; - easy exposure to oil residue or fuel elements; - atmosphere that has above standard levels of salt; - prone to dust collecting; - floor surface with a slope higher than 10 ° ; - voltage from wall sockets is changing severely; - exposure to direct sunlight.

3. Normal life of this instrument: 10 years from delivery providing regular maintenance is performed.

4. Carelessness of installer or damage by a defective product may cause problems. If you are having problems, contact the manufacturer G2 Optic Co., Ltd. or your authorized dealer to obtain the assistance of a qualified technician.

	WARNING
	When using the instrument, be careful that the safety problems can occur.
	If any problem comes up, never attempt to repair it yourself. Please contact your local authorized dealer and obtain help from a qualified technician.

	- Manufacturer accepts no responsibility for problems and accidents resulting from arbitrary disassembly and modification by the user or unqualified technician. - The instrument is a precision optical medical device so that it must be used by trained opticians, ophthalmologists or related field employees. Do not allow children to operate it. - Installing the instrument around equipment which uses electromagnetic waves like television or radio can cause malfunction. - Because this product is using electricity, touching the plug with wet hands, can cause shock. Always be careful of an electric shock. - This instrument requires periodic checking for any damage of the power cord because it can cause fire or an electric shock. - If the inside lens or similar part is touched by hand directly, an accurate measurement can be difficult.

	- Be sure that the power cord is plugged into the outlet securely. Failure can cause fire or an electric shock. - Read the user manual carefully for precise use. - You can prevent malfunctions and accidents caused by the instrument only if you read user manual carefully before using the instrument.

18.4 ENVIRONMENTAL CONDITIONS FOR PACKAGING IN STORAGE

(Product in its normal transport and storage container as provided by manufacturer)

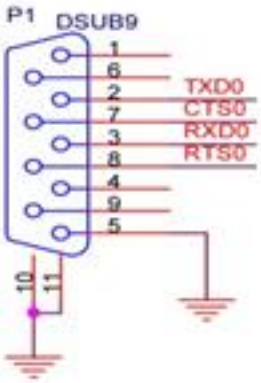
- Temperature: 10˚C to 40˚
- Humidity: 10 % to 90 %

18.5 ELECTRIC RATING

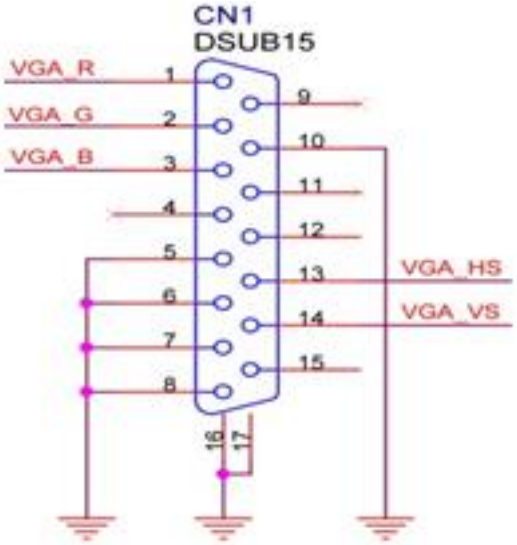
- Source voltage: AC 100-240 V, 50/60 Hz
- Power input: 55-85 VA

18.6 PINS ARRANGEMENT FOR EXTERNAL INTERFACE

- RS-232C Port



- VIDEO OUT Port



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